Professional Development Programme 2021

Building Resilience into School Systems: Policy and Practice

Transforming Teaching & Learning in School Education with Education Technology

7 Dec 2021

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Ice-breaker

Ice-breaker rules

1. A picture will be shown on the slide, whoever can identify which country this picture is taken can put the answer in the chat box.


Coronavirus world map: which cc
theguardian.com/world/2020/apr/03/coronavirus-world-map-which-countries-have-the-most-cases-and-deaths
Guardian graphic. Sources: Johns Hopkins CSSE, WHO, CDC, NHC and Dingxiangyuan
In Europe most countries have closed schools, and many are in lockdown.
Confirmed cases of Covid-19 in Europe, Middle East and North Africa
Data correct at 09.55 UTC 4 April
Iceland 1,364
Norway 5,370
Finland 1,615
Sweden 6,131
UK 38,168
Ireland 4,273
Belgium 16,770
Germany 84,159
France 64,338
Spain 119,199
Italy 119,827
Greece 1,613
Romania 3,183
Georgia 155
Iran 53,183
Iraq 820
Bahrain
Israel
Morocco 791
inspiron


NEW HORIZONS
workshop
COMPUTER
HARDWARE


DRAGON

Transforming Teaching & Learning in School Education with Education Technology

Jeffrey Xu
Yoonee Jeong

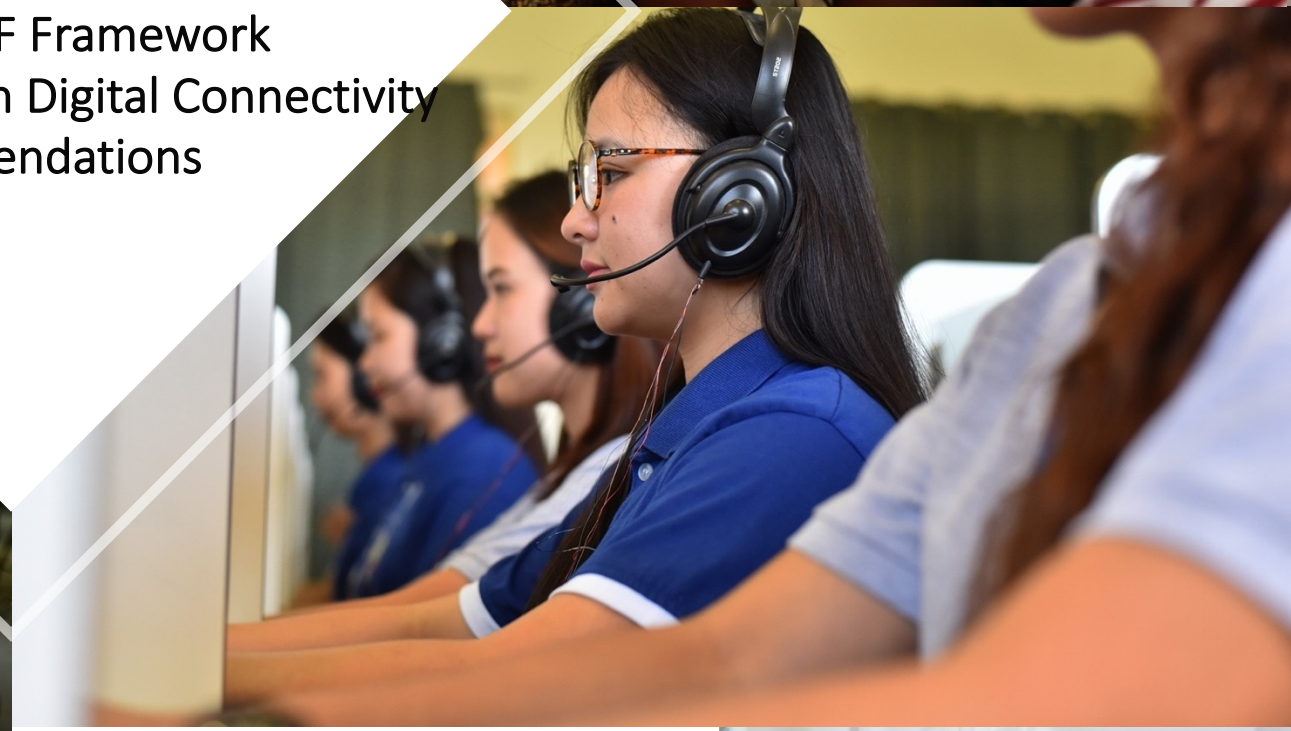
Self Introduction
Jeffrey Xu

- ADB Education Sector Group, expert pool in Education Technology
  - Covers ADB's engagement in education technology related projects with DMCs: Uzbekistan, Sri Lanka, Amenia, Bangladesh, Kyrgyz Republic, Cambodia, Fiji, Nepal, etc.
- Prior to joining ADB, with one of the largest education technology companies in China for 6 years
- Information Technology professional with over 22 years of experiences of digital transformation in different sectors including:
  - Education: New Oriental Education Technology Group (China)
  - Real estate (CapitaLand China)
  - Pharmaceutical (Novartis China)
  - Financial services (Freddie Mac USA)
  - Satellite Communications (DirecTV USA)
- M.S in Computer Science & MBA in Finance from Virginia Tech USA
- Three Children, Daughter (21 years old), Son (18 years old) , Daughter (12 years old)

Self Introduction (Yoonee Jeong)

- ADB Digital Technology for Development, focused on client engagement and support related to digital connectivity and digital economy policies
- ~ 20 years of hybrid experience in research/consulting, public policy and international development with project and advisory experience in over 20 countries in Asia and Africa
- Prior experience includes:
  - ✓ Public policy and regulatory affairs director for one of the largest global mobile operators focused on emerging markets in Asia
  - ✓ Digital development policy consultant for the World Bank
  - ✓ Research and consulting director for an economics and public policy consultancy
  - ✓ ICT4D Capacity building specialist with the UNESCAP
- MA in International Development Policy (Development Economics concentration) from Duke University, Undergraduate in Ateneo de Manila University in the Philippines

1. The Trilemma
2. Emerging Country Needs
3. Global EdTech Trends
4. ADB DERF Framework
5. Primer on Digital Connectivity
6. Recommendations



1. The Trilemma: Country Challenges Pre and Post COVID-19

I.

The Trilemma -Challenges of education systems

Challenge 3:
Quality learning with affordable cost but failed to scale

Challenge 1:
affordable education with scale but with poor quality

Challenge 2:
High quality/personalized learning with scale but not with sustainable cost

Challenges Post COVID 19

- Amplified existing inequities and learning crisis
- Lack of digital contents and assessments
- Lack of teacher readiness to manage distance learning
- Lack of teacher in-service training
- Shift of learning not only in school but also at home (learning anytime anywhere)
- Sudden demand to mainstream EdTech solutions and much wider acceptance in public education
- Government policies key to apply distance education in a more holistic way and by linking short-term and long-term solutions
- How to protect and mobilize education finance at a time when revenues are declining, and costs are increasing

source: newatlas.com

source: world economic forum

2. Emerging Country Needs

II.

Live Survey Number 1: What's the most critical barrier?

Following have been identified as barriers for effective digital learning in developing countries. Which to you, and your country, is the most critical barrier? Please choose one (1).

A. Digital infrastructure (connectivity and devices)
B. Effective government policy and strategy for digital transformation
C. Readiness of teachers as key stakeholders for digital learning
D. Parental or community support for out-of-school learning
E. EdTech providers supply in the country to support development of customized technology platforms and localized digital contents

Emerging Country Needs from Asia

SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

5 OVER-ARCHING PRIORITIES:

1. How to sustain uninterrupted learning: online, offline, mobile apps, TV/Radio, print?
2. How to ensure health, safety and wellbeing of teachers and learners for reopening schools and continued learning?
3. How to revamp training of teachers and trainers to transform teaching and learning?
4. How to develop digital learning materials and embed large scale and real-time learning assessment systems?
5. How to scale learning and equity in a balanced way?

3. Global Education Technology Trends

III.

Digital principles: a set of recommendations about how we can chart a path forward in digital development.

Design for Scale Achieving scale requires adoption beyond an initiatives pilot population and often necessitates securing funding or partners that take the initiative to new communities or regions.

Understand the Existing Ecosystem Well-designed initiatives and digital tools consider the particular structures and needs that exist in each country, region and community.

Be Collaborative Being collaborative means sharing information, insights, strategies and resources across projects, organizations and sectors, leading to increased efficiency and impact.

Design With the User User-centered design starts with getting to know the people you are designing for through conversation, observation and co-creation.

Address Privacy & Security Addressing privacy and security in digital development involves careful consideration of which data are collected and how data are acquired, used, stored and shared.

Build for Sustainability Building sustainable programs, platforms and digital tools is essential to maintain user and stakeholder support, as well as to maximize long-term impact.

Be Data Driven When an initiative is data driven, quality information is available to the right people when they need it, and they are using those data to take action.

Use Open Standards, Open Data, Open Source, and Open Innovation An open approach to digital development can help to increase collaboration in the digital development community and avoid duplicating work that has already been done.

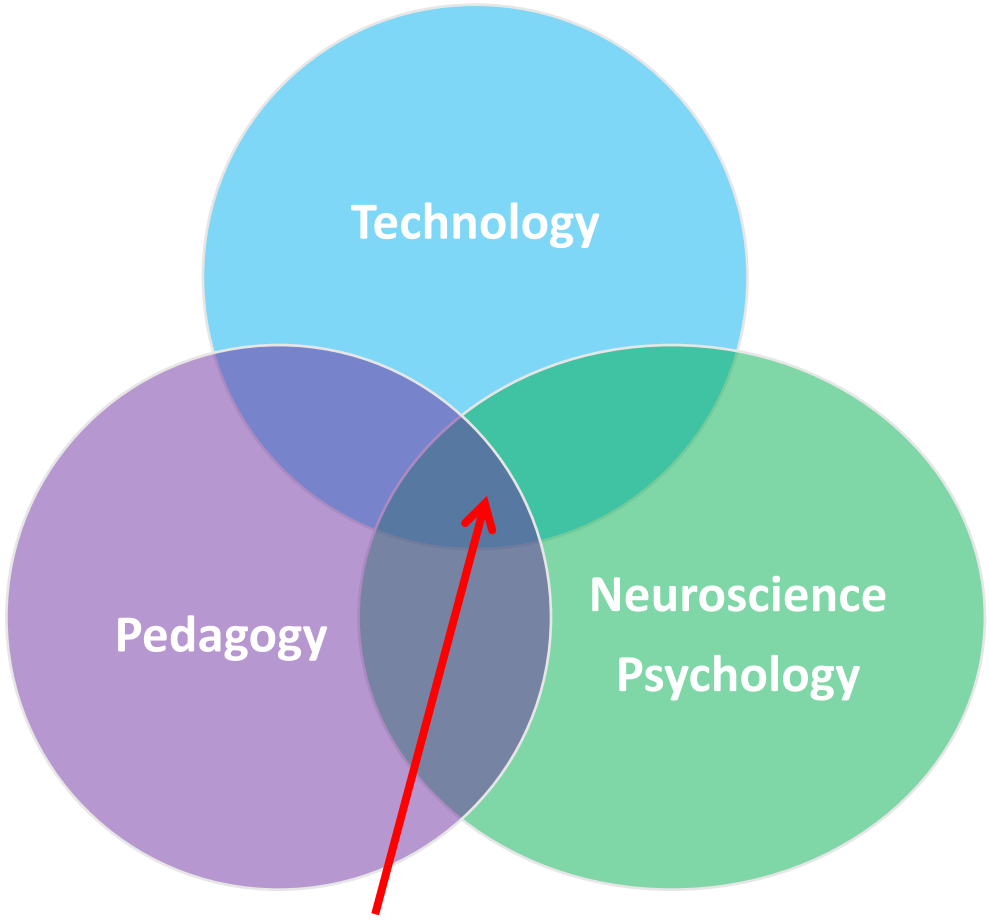
Reuse and Improve Reusing and improving is about taking the work of the global development community further than any organization or program can do alone.

EdTech in the prior 10 years and next 10 years
Huge Opportunities to be mainstreamed

	2010 Source: Worldbank	2020 Source: Forbes
1	**Ubiquitous learning (incl. mobile Learning)** With the emergence of increasingly robust connectivity infrastructure, cheaper computers and mobile technologies, school systems globally are developing the ability to provide learning opportunities to students "anytime, anywhere".	**More accessible education** Online learning makes education available to those even in remote areas as well as make it easy to share curriculum across borders. Technology can improve access to education. Students can access communities of experts.
2	**Smart portfolio assessment** The collection, management, sorting, and retrieving of data related to learning will help teachers to better understand learning gaps and customize content and pedagogical approaches. Also, assessment, being supported by real-time data collection technologies, is becoming increasingly formative.	**More data-driven insights** By analyzing the data about how digital content is consumed, or educational technology is used, valuable data-driven insights for how to enhance learning can be attained. Technology, including big data, machine learning, and artificial intelligence, allow for in-depth personalization of the content for an individual's learning needs.
3	**Personalized learning (and teaching)** Education systems are investigating the use of technology to better understand a student's knowledge base from prior learning and to tailor teaching to both address learning gaps as well as learning styles. The role of the teacher in the classroom is being transformed from that of the font of knowledge to an instructional manager helping to guide students through individualized learning pathways, identifying relevant learning resources and creating collaborative learning opportunities.	**More personalized education** EdTech improves the quality of interactions with teachers. Today's classrooms are diverse and complex, and access to technology helps better meet each student's needs. Technological tools can free teachers up from administrative tasks such as grading and testing to develop individual student relationships. Teachers can access a variety of learning tools through technology to give students differentiated learning experiences outside of the set curriculum.
4	**Teacher-generated open content.** Schools are empowering teachers and networks of teachers to both identify and create the learning resources that they find most effective in the classroom. Using online sources, teachers can easily customize material to suit specific learning needs, such as style and pace of the learning course.	**More immersive education** Extended reality encompassing virtual, augmented, and mixed reality brings immersive learning experiences to students no matter where they are. This technology enables learning by experiencing. A lesson about ancient Egypt can literally come alive when a student puts on a VR headset and walks around a digital version of the time period.
5	**Redefinition of learning spaces.** The ordered classroom of 30 desks in rows of 5 will soon become a relic of the industrial age as schools are re-thinking the most appropriate learning environments to foster collaborative, cross-disciplinary, student-centered learning.	**More automated schools** Automation will continue to alter schools as more smart tools get incorporated, including face recognition technology to take attendance, autonomous data analysis to inform learning decisions as well as help automate administrative tasks.

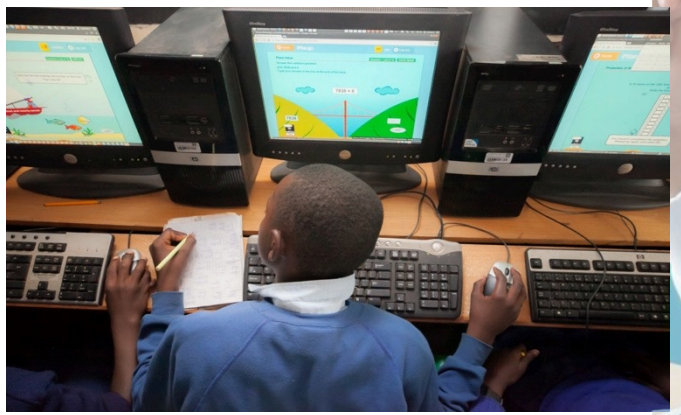
Top EdTech Trends Post COVID-19 (Trend 1)

From Tech-Centric to Tech-Inclusive Technology Convergence

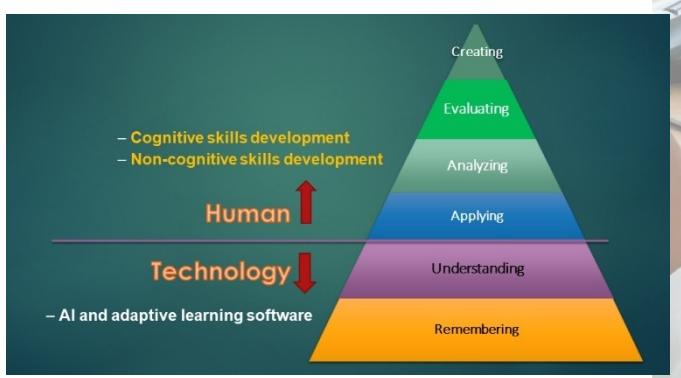


Advancements across multiple disciplines create more effective learning

Interactive Classrooms



Tech-savvy personalized learning



Matching Technology with Human Support

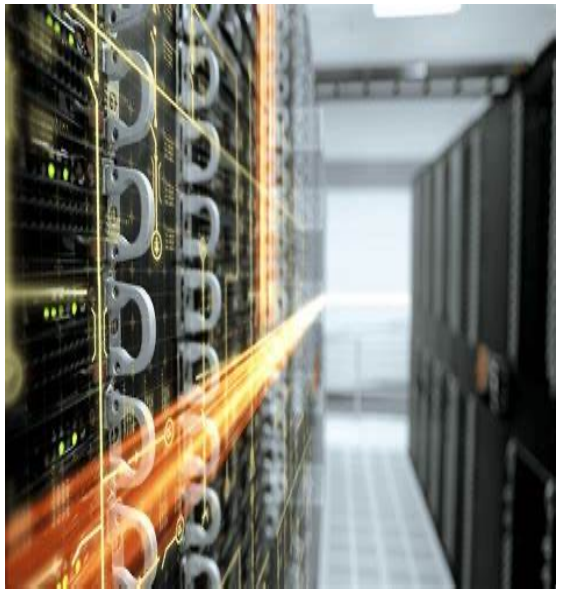
Photo Source: HTHT Consortium

Top EdTech Trends Post COVID-19 (Trend 2)

Infrastructure investments that further enable education technology

Network 4G/5G/Satellite

Electricity



IDC

Top EdTech Trends Post COVID-19 (Trend 3)

Blended learning in teacher training prominent opportunities

Electronic teaching materials
- good quality demo videos,
- lesson plans
- interactive study materials
- …

Well-designed teacher training systems can become a good complement and even replacement in some cases to the traditional face to face cascade teacher training models

Practice
- trial teaching
- preparing lesson

Teacher learning
- self-taught
- live streaming teacher training lessons
- on-line examination
- …

Top EdTech Trends Post COVID-19 (Trend 4)

Immersive learning through AR(Augmented Reality)/VR(Virtual Reality)

4. Education Technology Framework

IV.

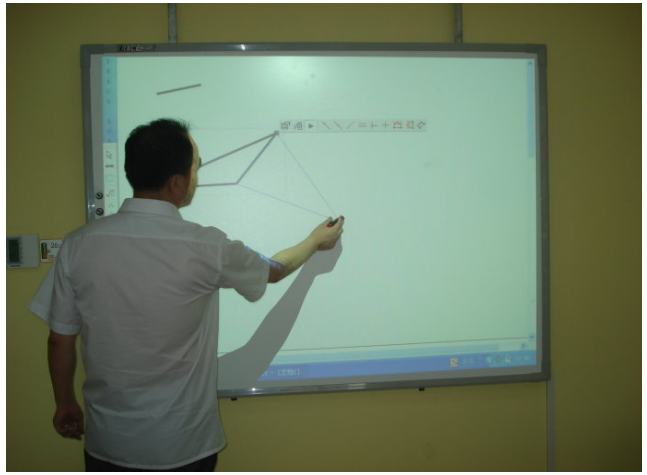
Live Survey Number 2:
What is the future of digital learning?

What is the future of digital learning?

A. Adaptive and personalized learning
B. Distance and remote learning
C. Blended learning with online & offline
D. Online learning
E. Hybrid Learning

IV.

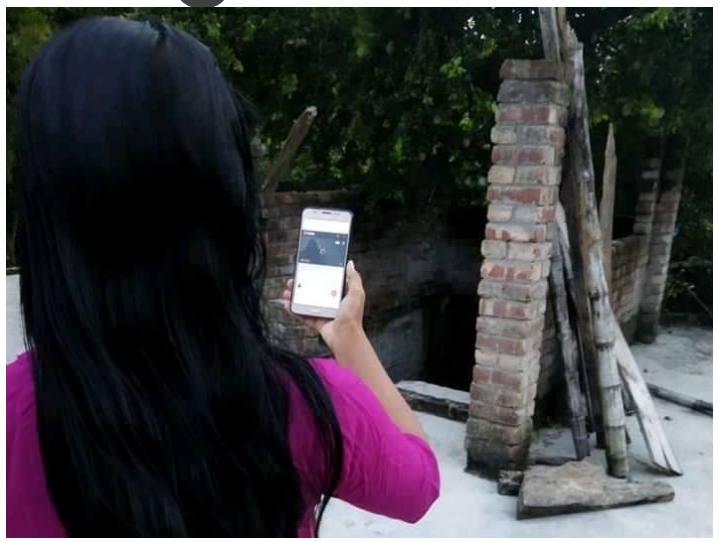
Lesson learned on technology interventions Interactive Whiteboards Project



1. **Rolled out to 30% of schools in the country**
2. **One year later, most of the white boards installed were either rarely used or already broken with no repairs**

1 Infrastructure	Internet connectivity – classrooms where whiteboard are installed don't have connectivity ICT devices/hardware – whiteboards 10 time more costly than comparable devices Power/electricity – Classrooms no stable electricity and power supply
2 Government/Policy	Funding/Policy – No maintenance and support budget M & E – No tracking on how many white boards used by how many teachers Contents – No supporting contents with delivery
3 Schools/Teachers	Teacher Training – Teachers are not trained to be comfortable using – No corresponding teacher guides
4 Students/Parents	Student Training – Students are not trained for To-Dos and Not-To-Dos – Many white boards are broken by students
5 Service providers	Support & Service Partners – Availability and Proximity of support, repairs, replacements – Integration with other systems and contents

Lesson learned on real life technology interventions Digital Content Portal Project



A. Content loaded on national repository
B. Multimedia consisting of e-books, videos, audio clips
C. Maintenance of the platform shows various issues -broken links, lack of metrics, poor quality & poor organization of materials

1 Infrastructure	Internet connectivity – Large video files demand for connectivity and data comsumption ICT devices/hardware – Demands bigger screen devices, not smart phone friendly
2 Government/Policy	Funding/Policy – No budget to upgrade the contents and platforms M & E – No tracking on content access by students Contents – Not linked with curriculum and assessments
3 Schools/Teachers	Teacher Training – Teachers are not trained to use and create customized digital contents
4 Students/Parents	Student Access – Student Login and usage are not tracked
5 Service providers	Support & Service Partners – Liaised with single provider for centralized content creation – no Integration with other systems and contents

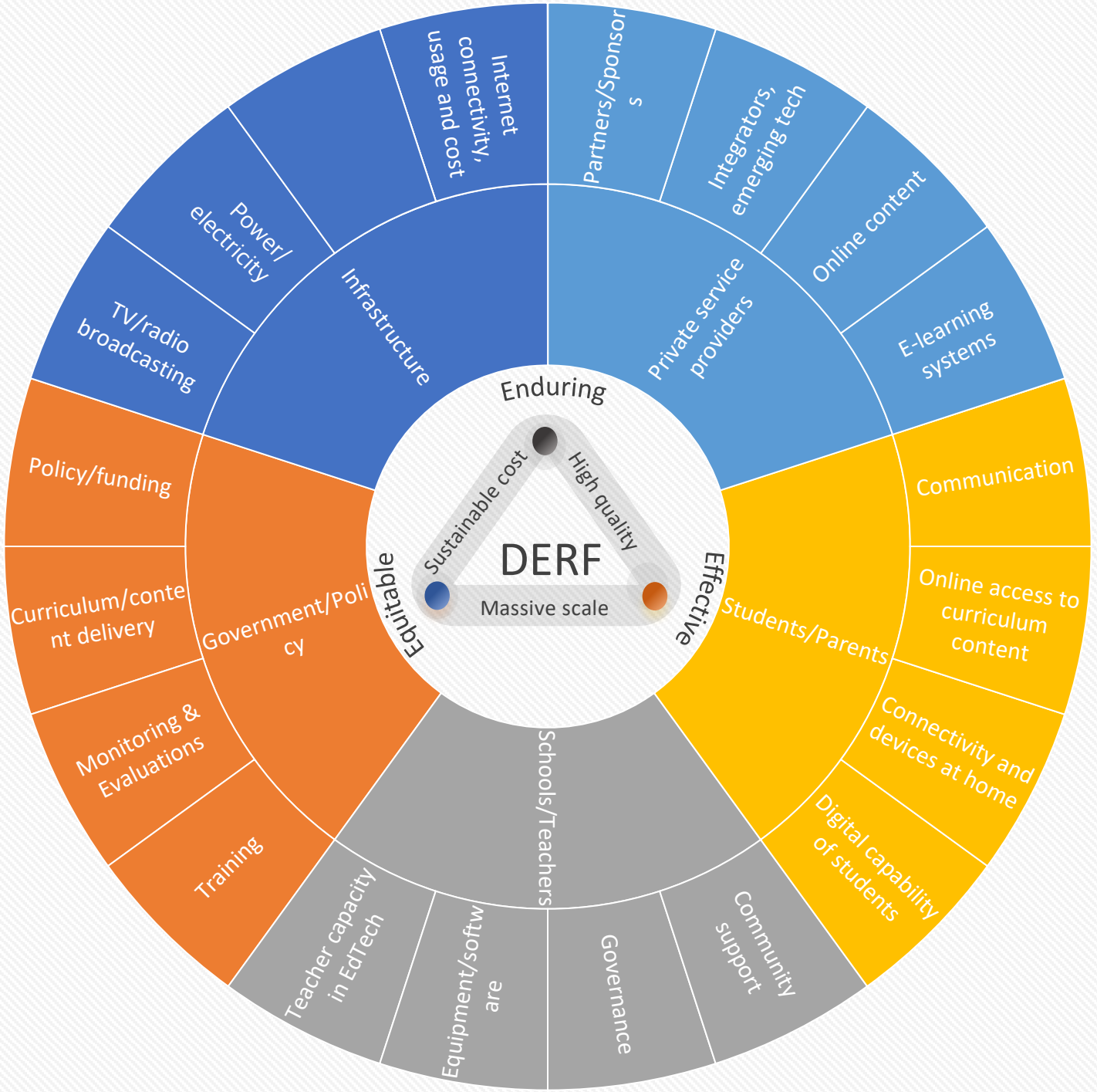
ADB DERI (Digital Education Readiness Index) Toolkit & Framework
Ecosystem Approach with Digital Transformation of Education

55 Total Indicators

1	Infrastructure	Internet connectivity, usage and cost ICT devices/hardware Power/electricity TV/radio broadcasting
2	Government/Policy	Policy/funding Curriculum/content delivery Monitoring & Evaluations Training
3	Schools/Teachers	Teacher capacity in EdTech Equipment/software Governance Community support
4	Students/Parents	Digital capability of students Connectivity and devices at home Online access to curriculum content Communication
5	Private service providers	E-learning systems Online content Integrators, emerging tech Partners/Sponsors

ADB DERF

Digital Education Readiness Framework



4 stages of readiness
Nascent
Emerging
Developed
Mature

5 pillars
20 subdomains
55 indicators

Digital Education Transformation

In-person Learning › Blended Learning › Digital Learning › Adaptive Learning

1 2 3 4

In-person leaning

Remote learning

Distance learning

Online learning

Blended leaning

Flipped learning

Project based learning

Hybrid Learning

Digital TPD

Digital Classroom

Digital Learning »

Adaptive Personalized Learning

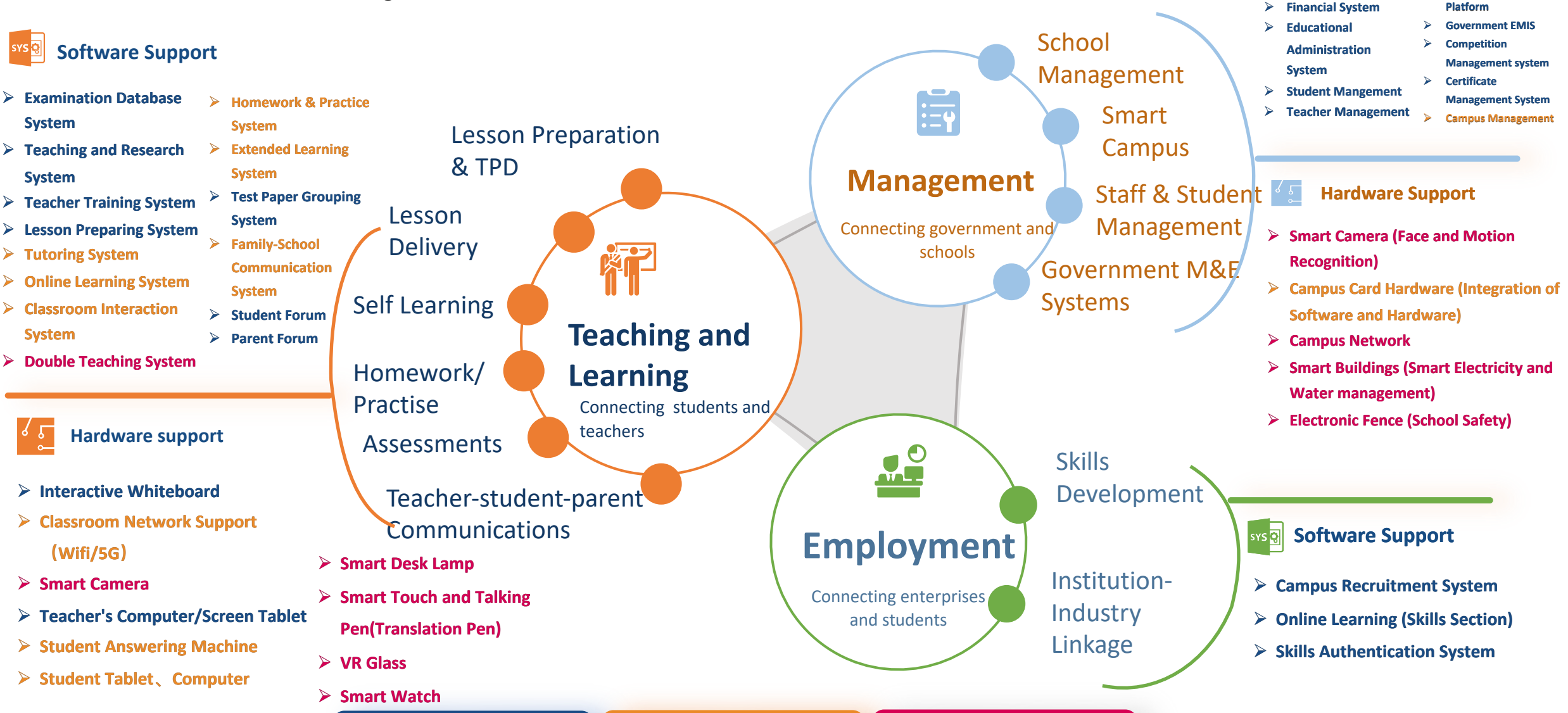
Smart MOE

Smart school

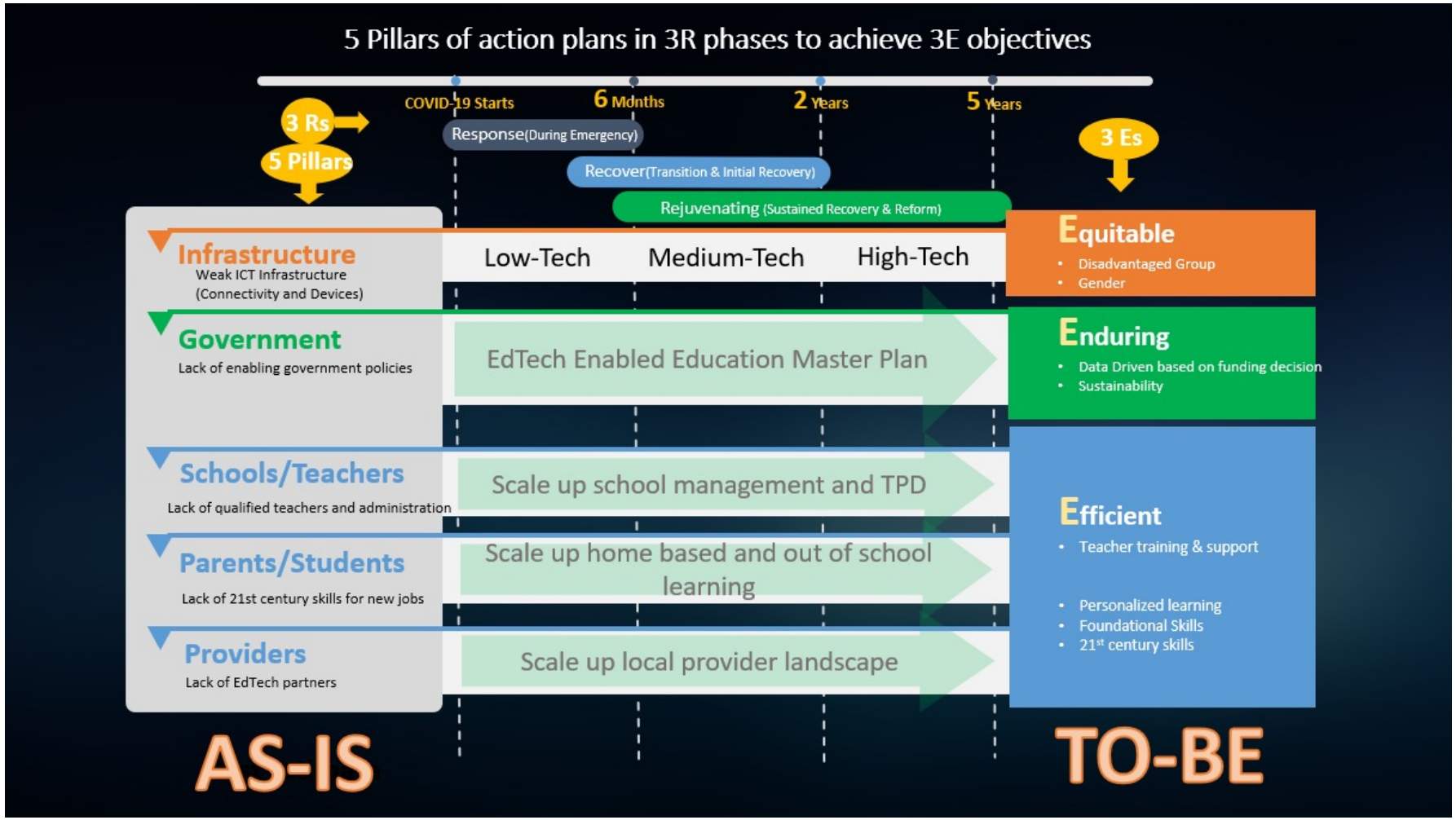
Smart classroom

What is true digital learning?

- 3 main categories of use cases,12 sub use cases
- Integrated solutions for software, hardware and network



Recap the Country Planning Framework



5. Primer on Digital Connectivity

V.

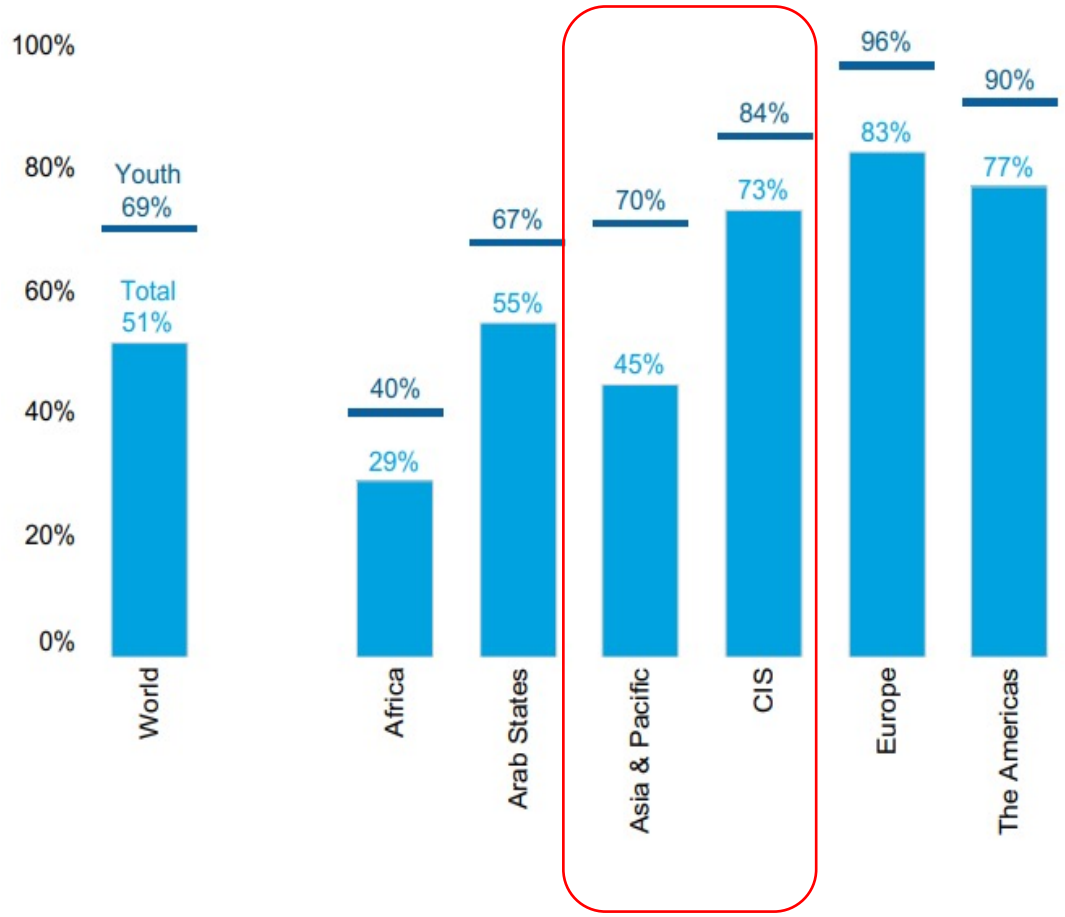
Persistent and widening digital divide

Only 45% of the population in Asia and Pacific* use the Internet.

The digital divide disproportionately affects:

- **Women:** In South Asia, women are **36%** less likely to use mobile internet
- **Children and Youth: 768 million** in South Asia and **369 million** children and youth in East Asia and Pacific lack home internet access.
- **Rural areas:** In developing countries, urban access to the internet is **2.3 times** as high as **rural access**.

% of Individuals using the Internet, 2019

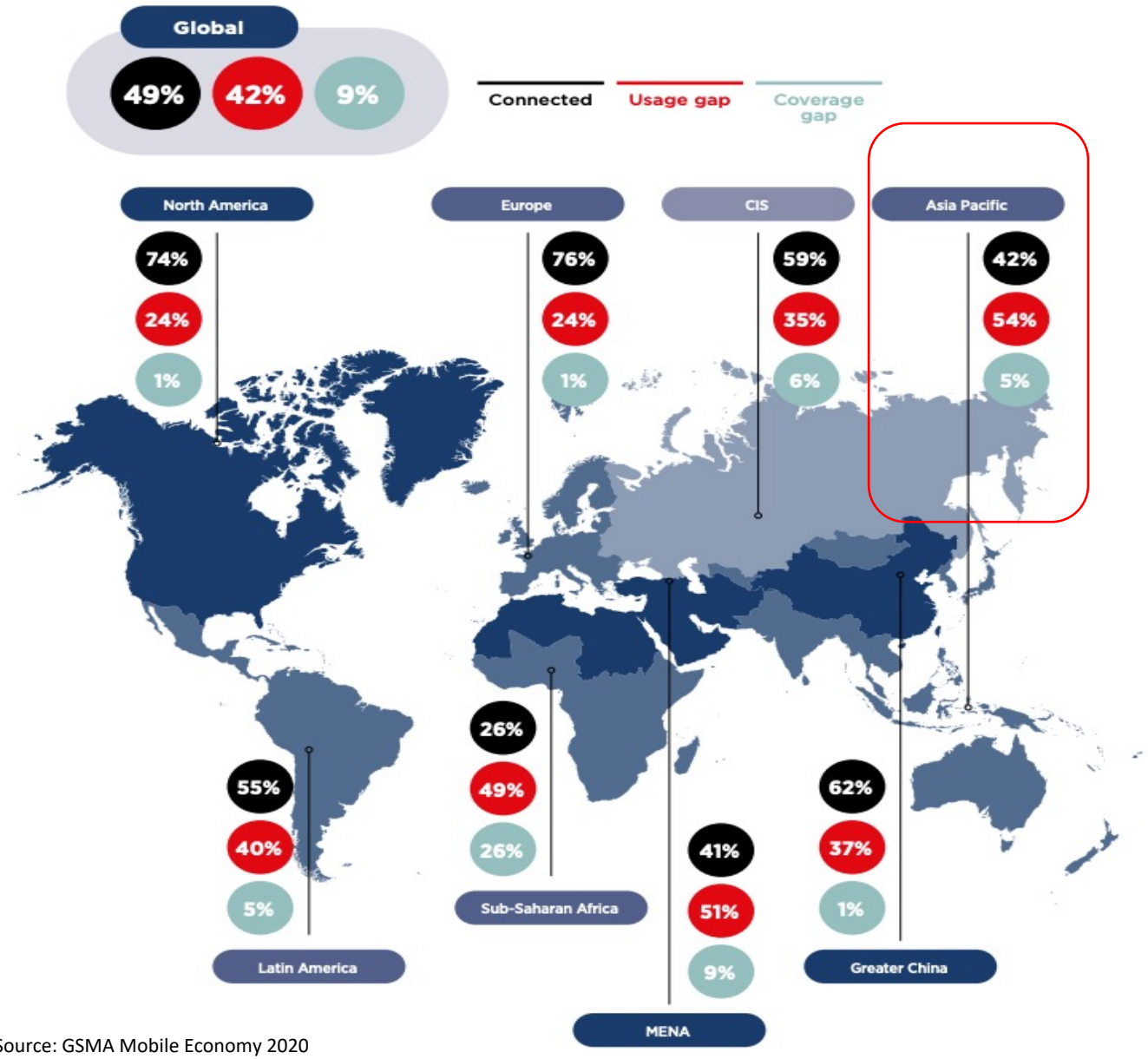


Note: Youth = 15-24 years olds

Source: ITU Facts and Figures 2020, GSMA Connected Women – The Mobile Gender Gap 2021

*The definition of Asia & Pacific is from ITU and does not include ADB's member countries in the Central West region.

Many faces of the digital divide: Usage Gap



USAGE GAP

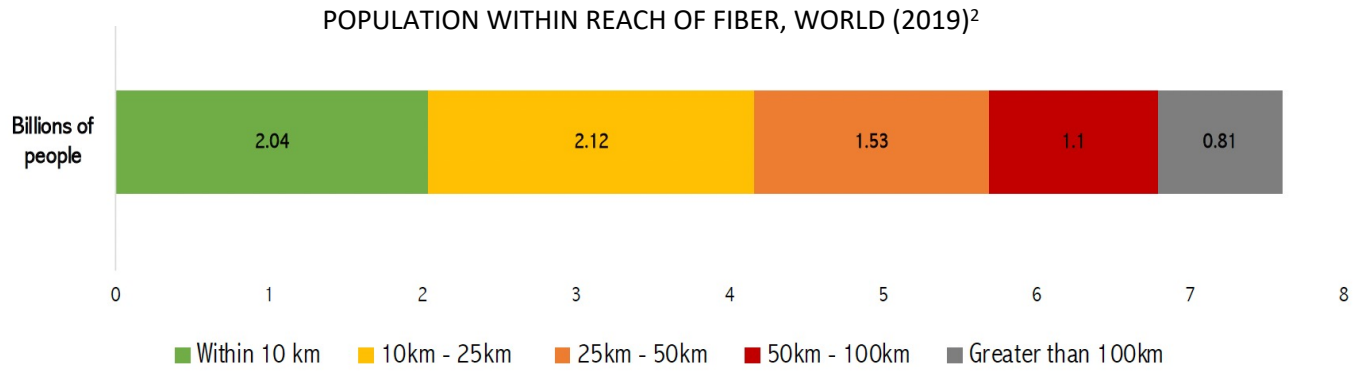
Those who are within the footprint of mobile broadband coverage (3&4G) but do not use the internet

Usage gap[1] of APAC the highest in the world at 54% (Global average at 42%)

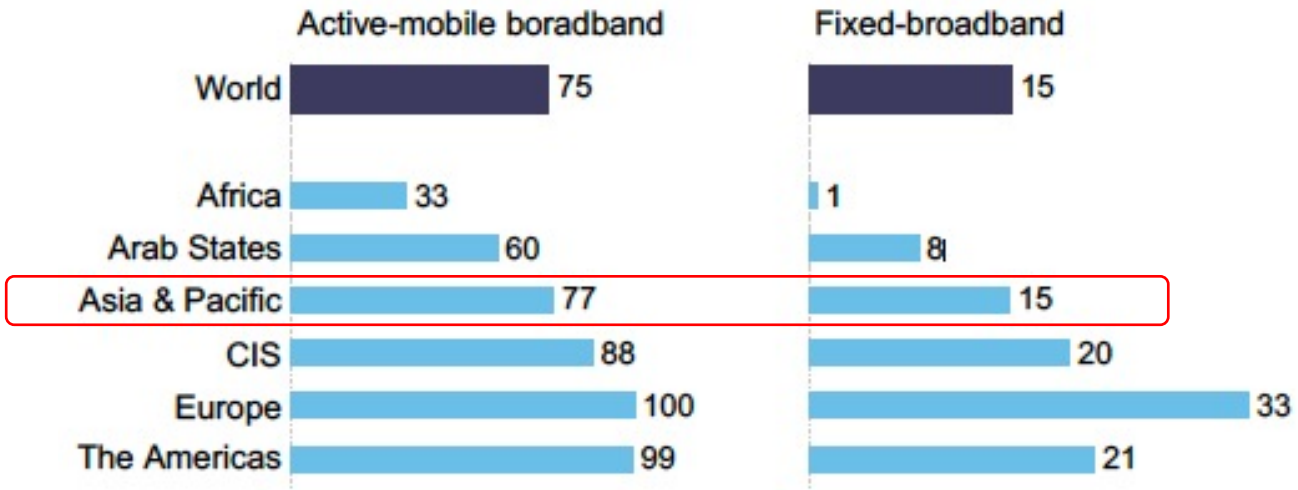
Source: GSMA Mobile Economy 2020

Many faces of the digital divide: Fiber deficiency

Only 2Bn live within 10km reach of high-capacity, high-speed fiber optic infrastructure.



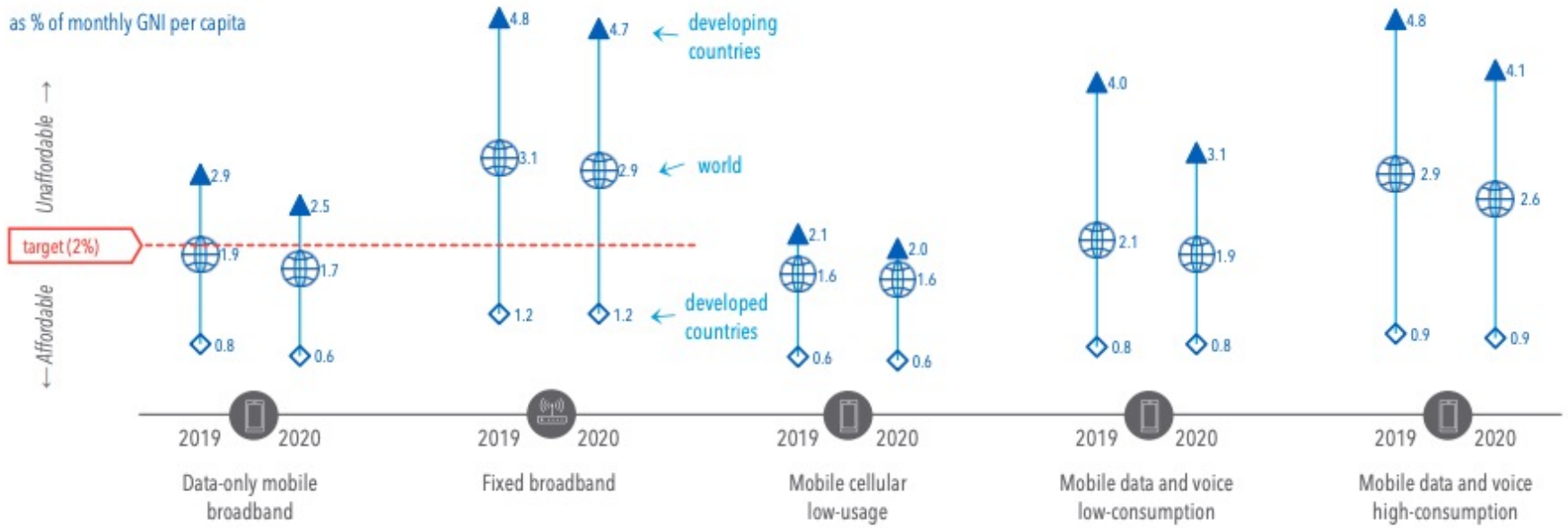
With APAC lagging behind other regions in fixed broadband adoption



Source: ITU Connecting Humanity 2020, ITU Facts and Figures 2020

Many faces of the digital divide: Affordability Gaps

Figure E1: Median price for the 5 baskets, by level of development, as a percentage of monthly GNI per capita, 2019-2020



Source: ITU price trends 2020

Quality – Meaningful Connectivity

Giga has set a minimum target for meaningful connectivity...

2024 target

Level of detail

20 Mbps per school

In short:

- Giga's view on meaningful connectivity is to deliver a minimum of 10 Mbps per school, but Giga will advise on a target for 20 Mbps per school where reasonable

20 Mbps per school
1 Mbps per 20 students
Monthly minimum of 100 GB

Nuanced:

- For larger schools, 1Mbps / 20 students is the target. This means ~15 Mbps for an average sized school of ~300 students
- The monthly minimum on data is 100 GB. Giga will advise on a target of 200 GB per month

20 Mbps per school
1 Mbps per 20 students
Monthly minimum of 100 GB
Download speed of 20 Mbps
Upload speed of 5 Mbps

In detail:

- Giga's minimum download speed for meaningful connection is 10 Mbps with an upload speed of 2.5 Mbps. As a target, Giga will advise for double the minimum download and upload speed

...which translates into certain technology options

Technology	Suitability
2G	✗
3G	✗
4G	✓
WISP	✓
Fiber	✓
Satellite	✓

Source: BCG, Country Operating Models for School Connectivity

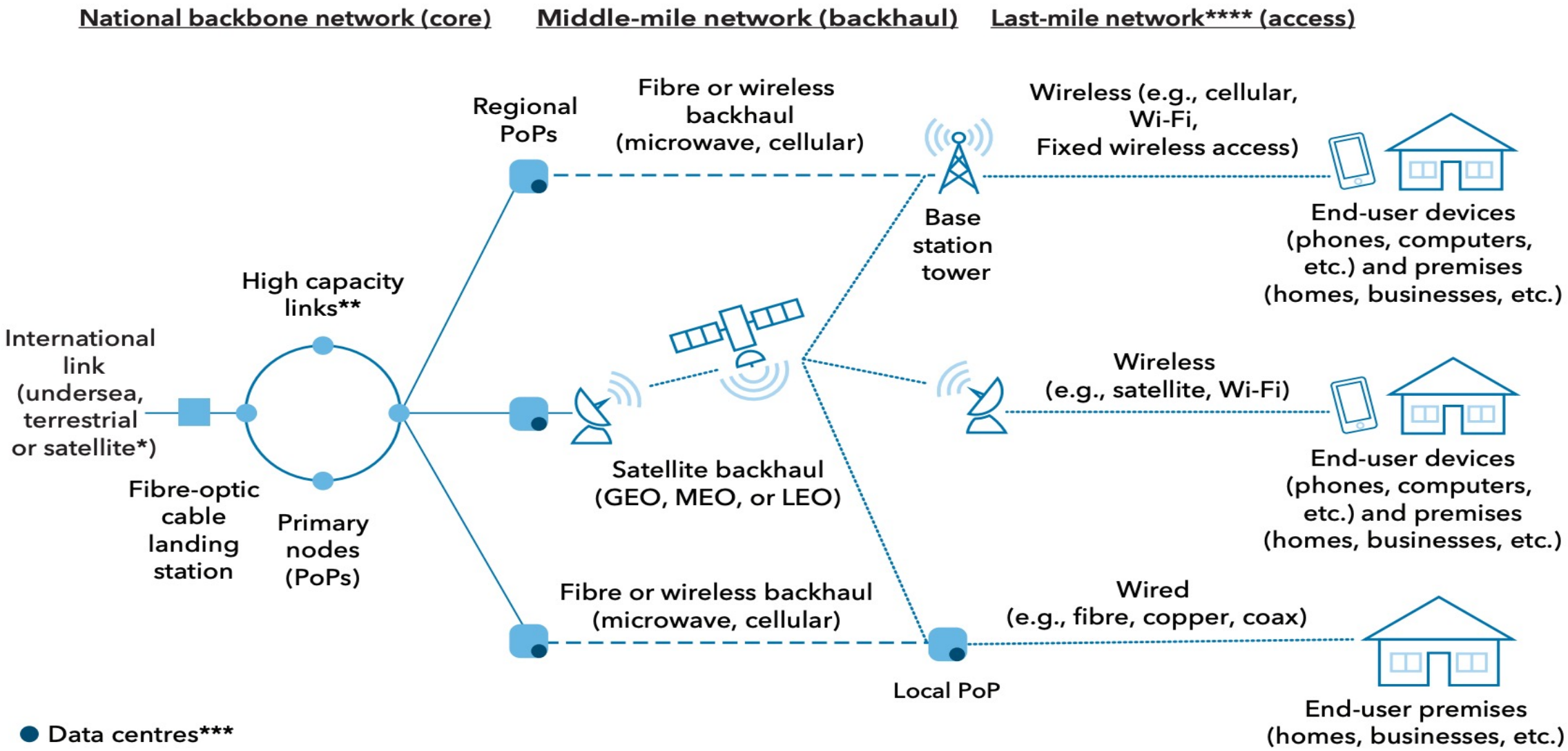
Quality – Meaningful Connectivity/Education Sector

Table 13: Sample broadband requirements for various activities in the education sector (download speeds)

Activity	Broadband speeds
Taking an online class	0.25 Mbit/s
Searching the web	1 Mbit/s
Checking e-mail	0.5 to 1 Mbit/s
Downloading digital instructional materials, including open educational resources	1 Mbit/s
Engaging with social media	0.03 Mbit/s
Completing multiple choice assessments	0.06 Mbit/s
Music streaming	2 Mbit/s
Video streaming – standard definition quality	3 Mbit/s
Video streaming – HD quality	5 Mbit/s
Video streaming – Ultra HD quality	25 Mbit/s
Streaming HD video or a university lecture	4 Mbit/s
Watching a video conference	1 Mbit/s
Participating in HD videoconferencing	4 Mbit/s
Participating in a video conference	1 Mbit/s per user
Engaging with a simulation and gaming	1 Mbit/s
Engaging in two-way online gaming	4 Mbit/s

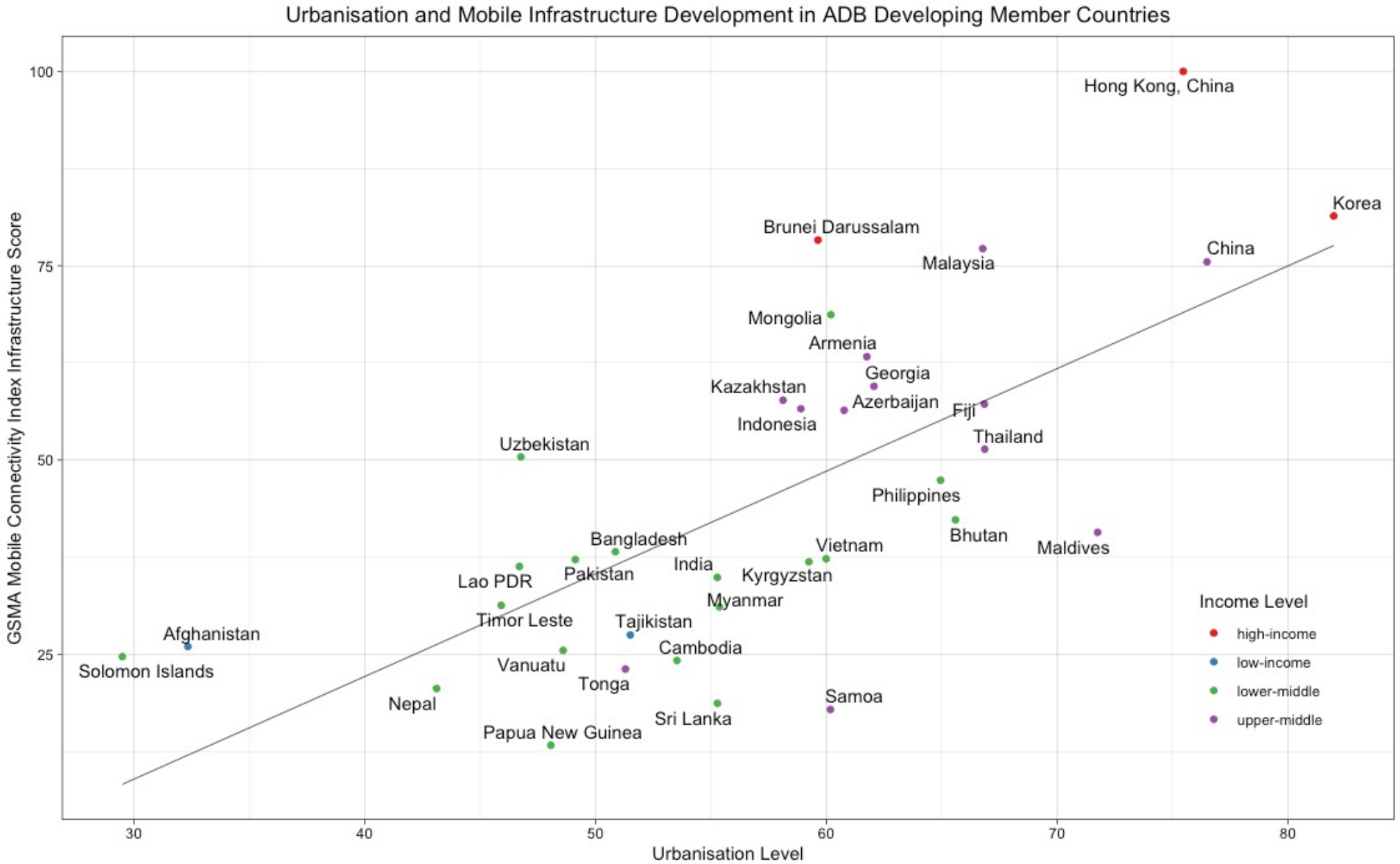
Source: adapted from State Educational Technology Directors Association

Describing a Telecommunications Network



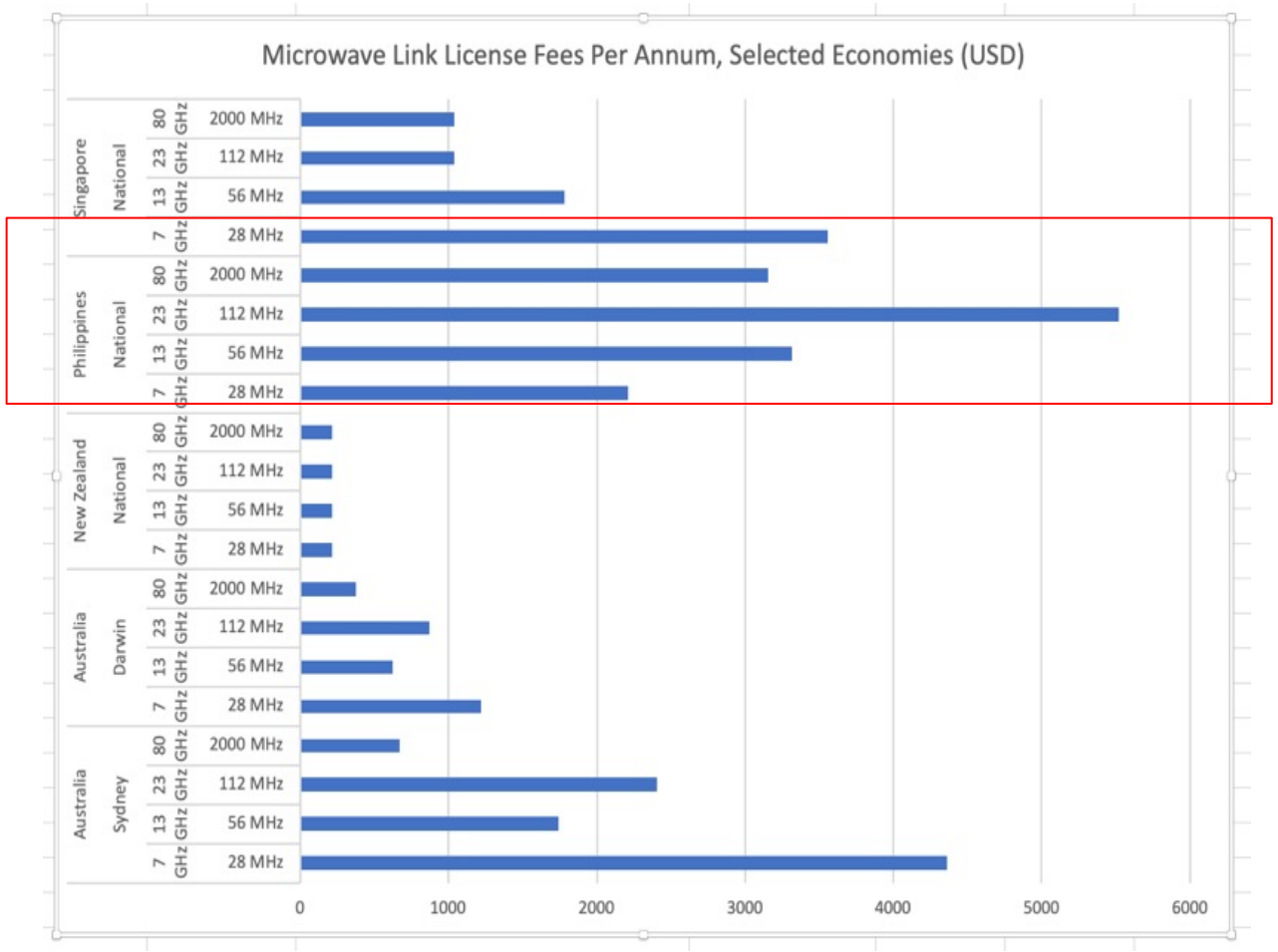
Source: ITU "Last-mile Internet Connectivity Solutions Guide", Forthcoming Dec 2020

Barriers: Geography & Population Density



Source: Upcoming Last-Mile Digital Connectivity Working Paper

Barriers: Access to Radio Spectrum



spectrum prices in developing countries have been **three times** higher than developed markets

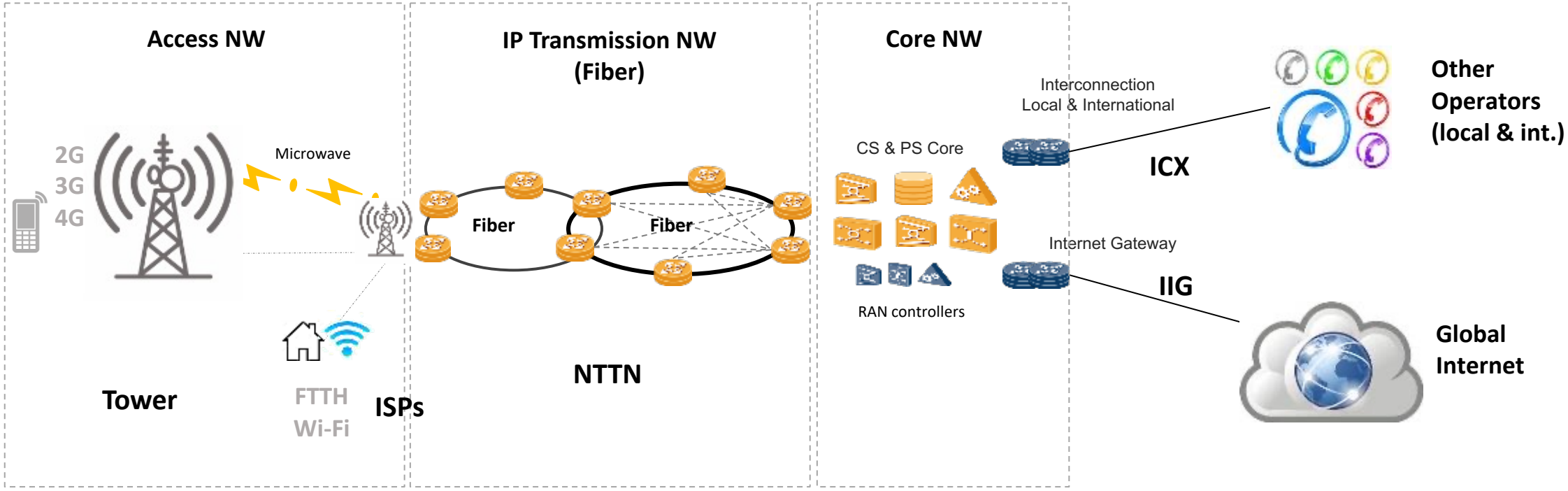
- Very high (reserve) prices
- Limited supply of spectrum
- Not publishing a spectrum roadmap
- Poor award rules (such as auction formats)

Source: Upcoming Last-Mile Digital Connectivity Working Paper

Barriers: Access to Energy, Land Use (RoW)

Barriers: Licensing

Example from Bangladesh



Tower
- 4 licensees
- BTRC heavily engaged in the MSLA discussion

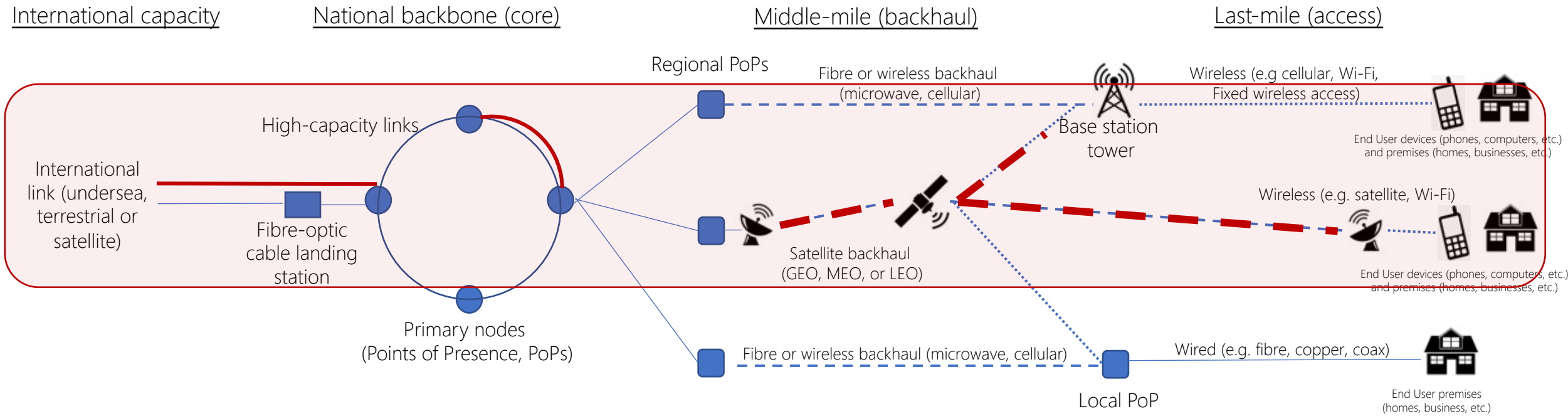
ISP
- 139 nationwide licensees

NTTN
- 5 licensees

ILDTS
- 26 ICX licensees
- 35 IIG licensees

Innovations: Satellite communications

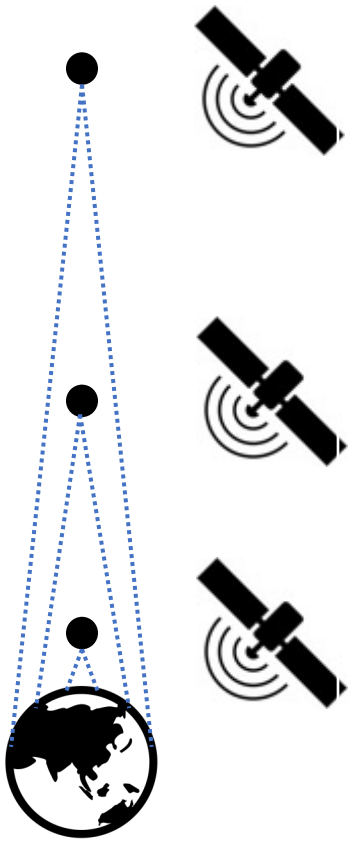
Telecommunications Network Infrastructure Elements
red lines highlight where satellite is utilized



Satellite in communications networks is predominantly utilized in last-mile and middle-mile links, but in few country cases, satellite continues to be the main, or only, source of international connectivity and in few country cases, national backbone networks utilize satellite (in addition to wireless microwave)

ITU Last Mile Internet Connectivity Solutions Guide, https://www.itu.int/en/ITU-D/Technology/Pages/LMC/LMC-Home.aspx

Innovations: Satellite communications



GEO
Geosynchronous/
Geostationary

MEO
Medium Earth Orbit

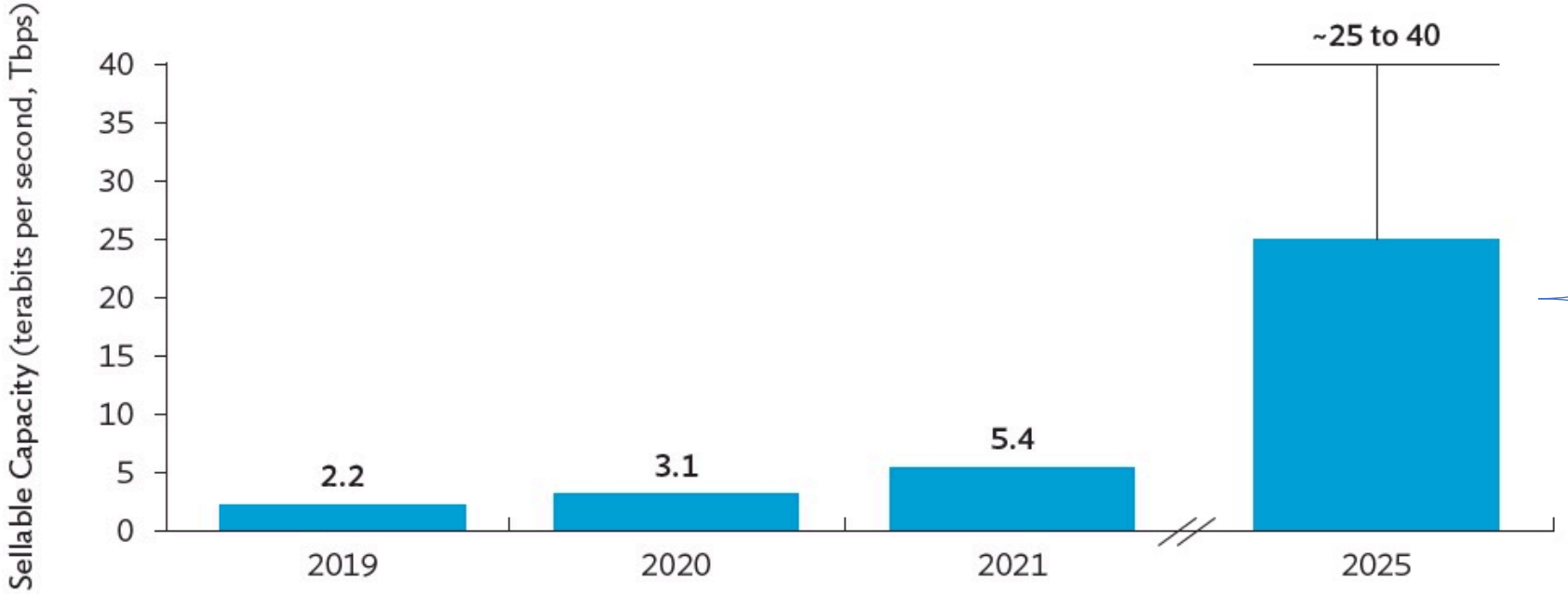
LEO
Low Earth Orbit

	Altitude	Latency (roundtrip)	Orbital Period	Number of satellites to span globe	Cost per satellite	Effective lifetime of satellite
GEO	35,786 km	~477ms	24 hours	3 (if necessary)	~US$100M to ~US$400M	15 to 20 years
MEO	2,000 to 35,786 km	~27ms to ~477ms	127 minutes to 24 hours	5 to 30 (depending on altitude)	~US$80M to ~US$100M	10 to 15 years
LEO	160 to 2,000 km	~2ms to ~27ms	88 minutes to 127 minutes	Hundreds or Thousands (depending on altitude)	~US$500,000 to US$45M	5 to 10 years

ITU Last Mile Internet Connectivity Solutions Guide, https://www.itu.int/en/ITU-D/Technology/Pages/LMC/LMC-Home.aspx

Innovations: Satellite communications

Forecasted Growth in Satellite Bandwidth Capacity, 2019 – 2015

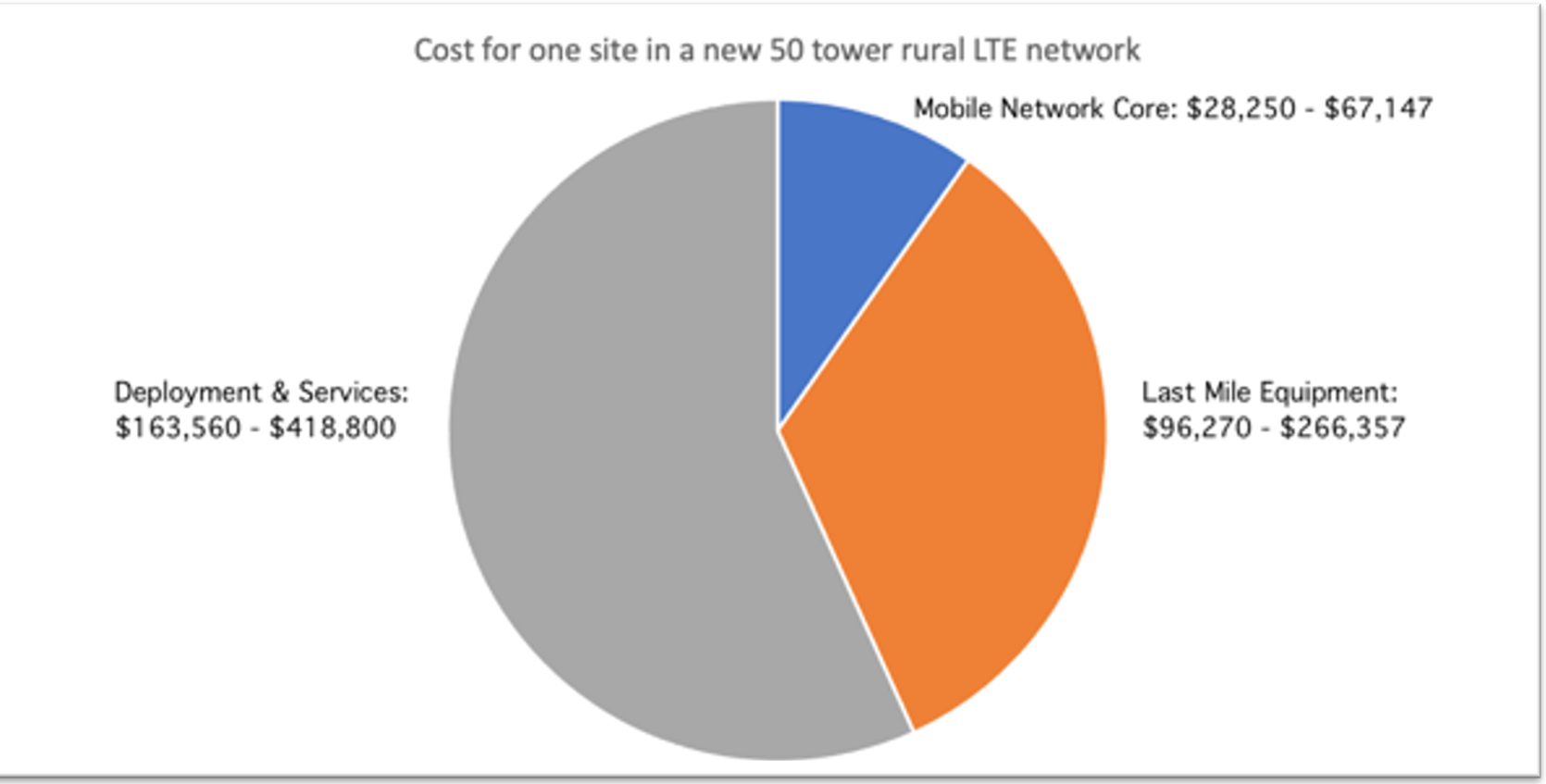


	Entity	Capacity Expected
LEO	Starlink	23.7 Tbps
LEO	Telesat	15 Tbps
LEO	OneWeb	1.5 Tbps
MEO	SES/O3b	10 Tbps
GEO	Viasat	3.0 Tbps
GEO	Echostar	0.5 Tbps

Similarly, Exane/BNPP (investment bank) forecasts satellite broadband capacity to increase from an estimated **2 Tbps** at the end of 2020, to **20 Tbps** by end of 2021, and **60 Tbps** by the end of the decade.

For detailed sources, see Figure 6 in ADB paper, "Digital Connectivity and Low Earth Orbit Satellite Constellations: Opportunities for Asia and the Pacific";
https://advanced-television.com/2021/02/12/report-satellite-broadband-capacity-to-grow-tenfold-by-year-end/

Innovations: Network Sharing

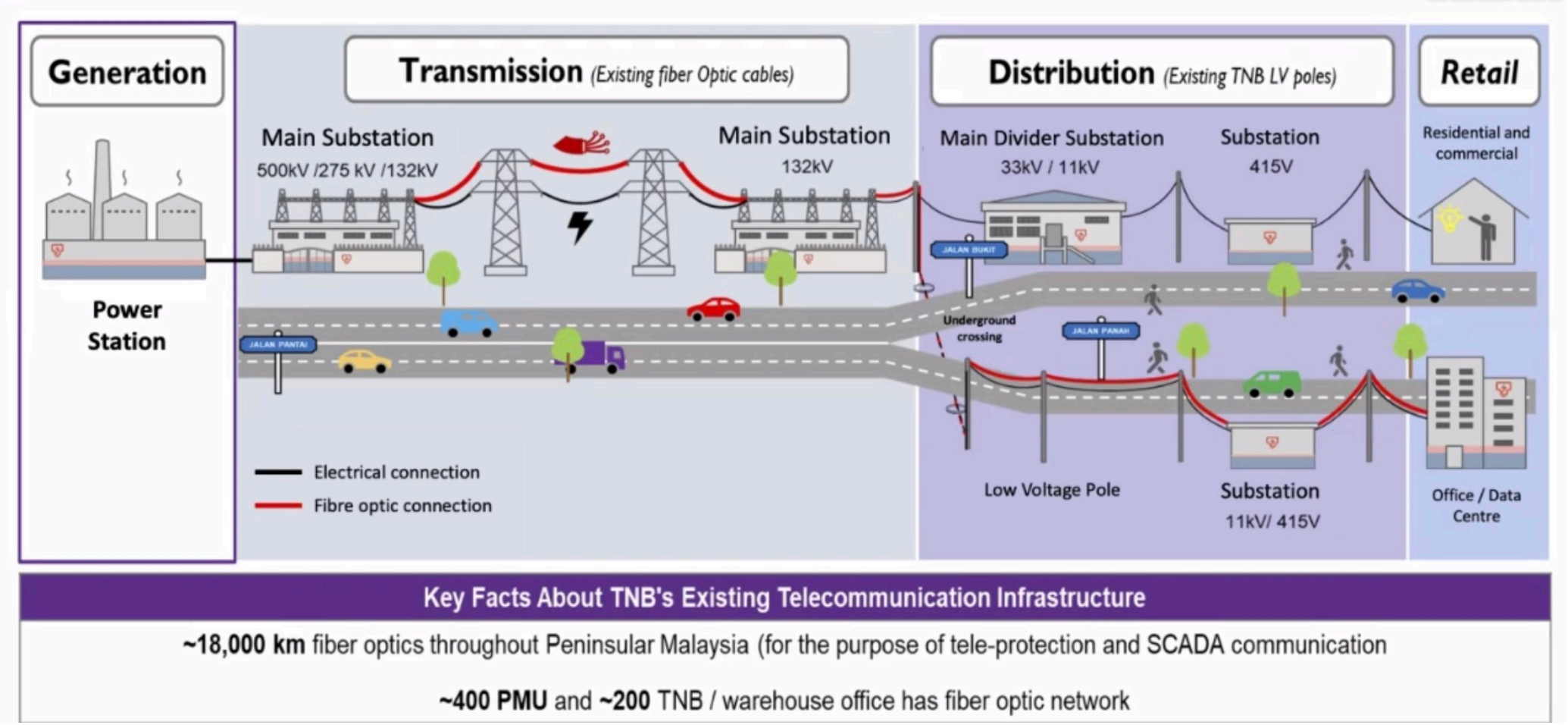


Network sharing

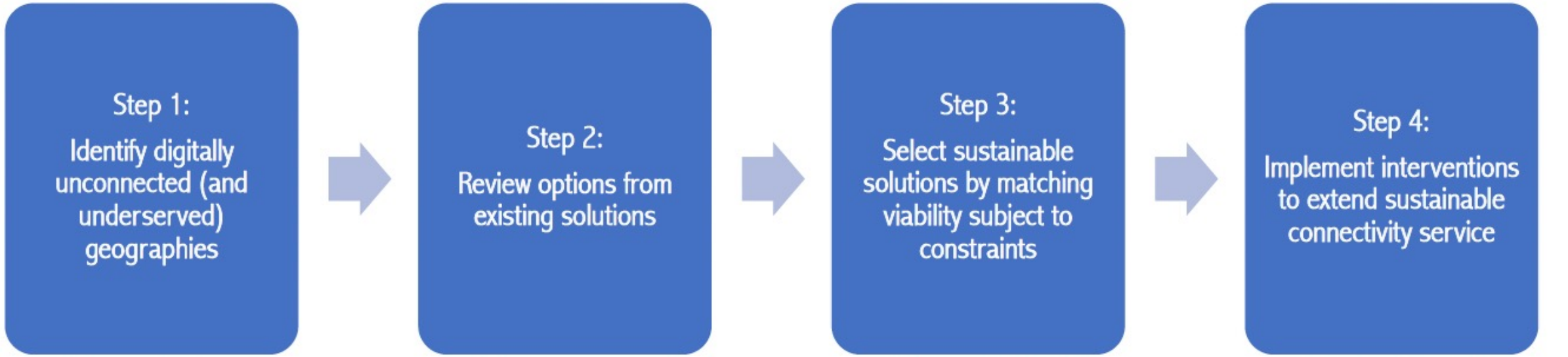
- Multi-Core Radio Network (MOCN)
- Multi-Operator Radio Access Network Sharing (MORAN)

Innovations: Cross-Sector Fiber Co-deployment and Sharing

Example from Malaysia



Step-by-step approach to connecting the unconnected



1a – Understand background challenges in mapping access and adoption
1b – Select a top-down and/or bottom-up mapping approach
1c – Map key elements: network infrastructure assets, potential demand and financial viability, and constraints on technology options

2a – Review the case study database of last-mile connectivity solutions
2b – Utilize the categorization/typology of interventions
2c – Understand the main characteristics of, and trade-offs between, different interventions

3a – Select an affordable last-mile connectivity solution
3b – Identify the components of an appropriate last-mile connectivity solution
3c – Draw up the decision matrix for feasible solutions
3d – Adopt additional tools to assess solutions

4a – Options for intervention – Introduction
4b – Options for intervention – Market efficiency actions
4c – Options for intervention – One-time financing (smart subsidy)
4d – Options for intervention – Recurring financing / subsidy
4e – Examples of options (from case study submissions)

Source: ITU Last Mile Internet Connectivity Solutions Guide 2021

Step 1: Identify Unconnected Communities

Top-down approach:

Large geographic areas (national or sub-national) are mapped by accessing secondary mapping data in order to identify infrastructure coverage gaps.
Additional characteristics:

- Data gathered from secondary sources such as national government agencies or third-party aggregators (e.g. satellite data, operator infrastructure, etc.)
- Tends to cover large geographic areas
- May develop a multipronged approach to connectivity interventions beyond a single site/location

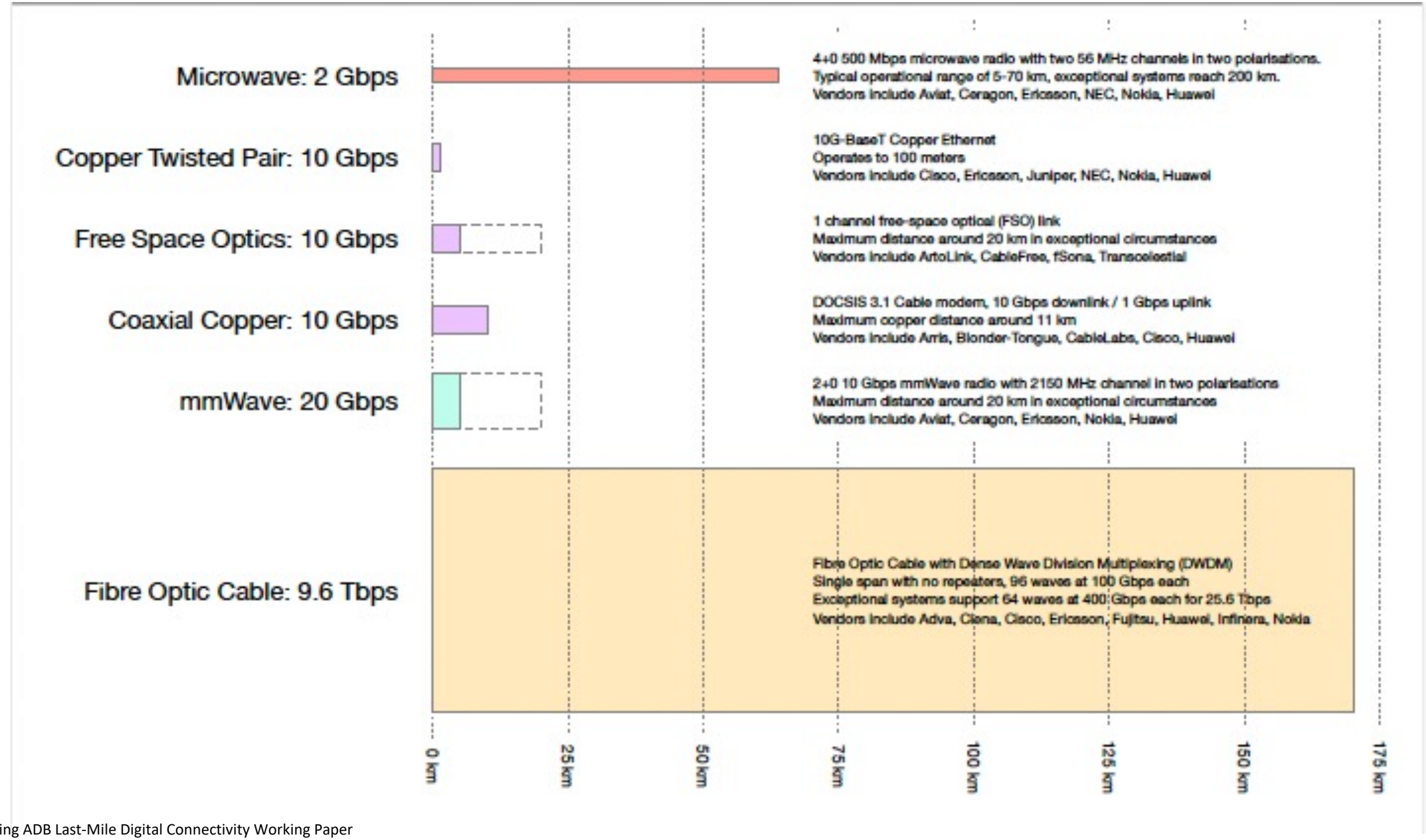
Bottom-up approach:

Starts with the specific, targeted locality, mapping local data and testing for different aspects of network infrastructure availability.
Additional characteristics:

- Local mapping (testing network infrastructure available in the vicinity)
- Adding socio-demographic attributes at the local level collected via census
- Includes relevant geographic and environmental conditions

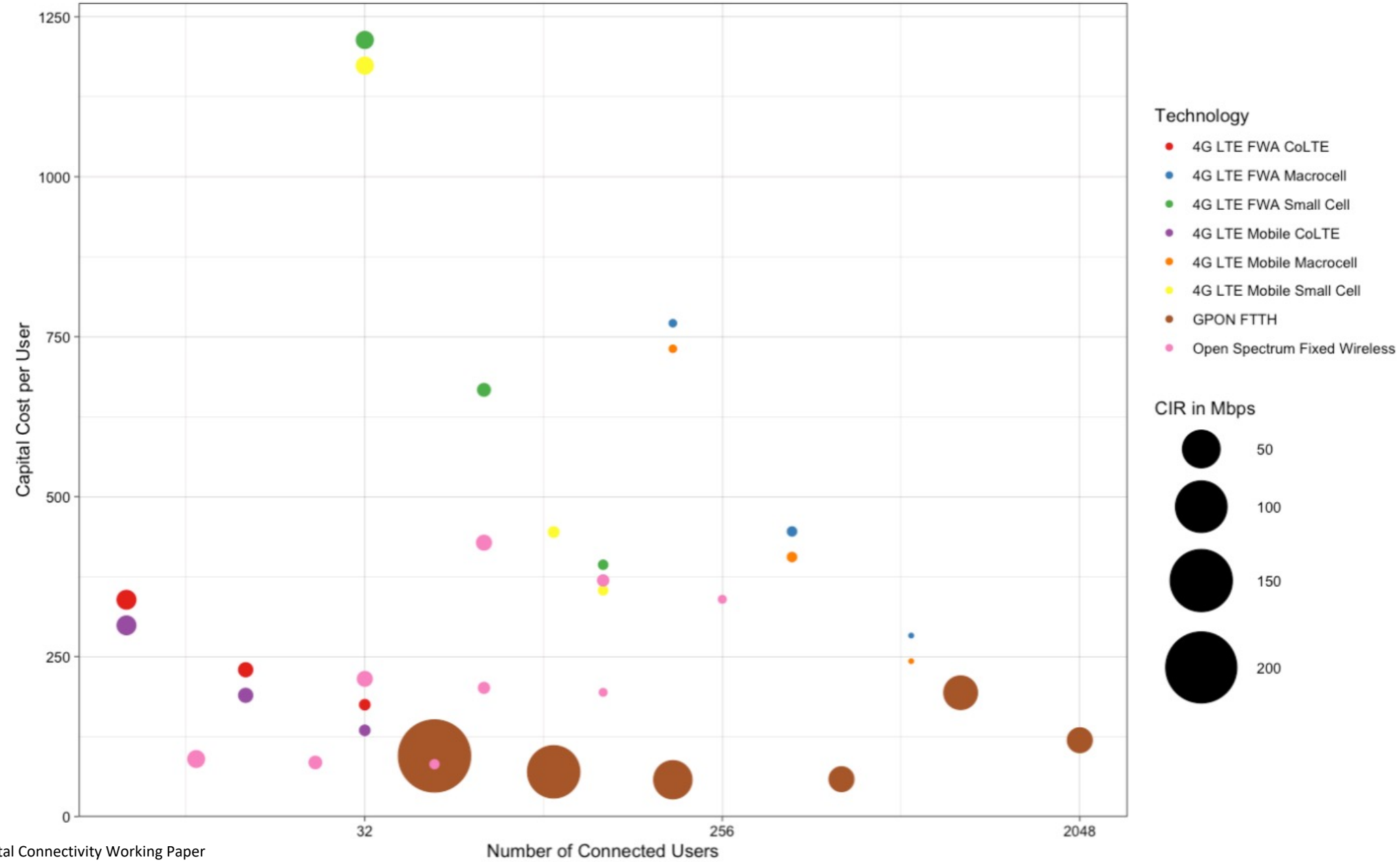
Source: ITU Last Mile Internet Connectivity Solutions Guide 2021

Step 2: Review options from existing solutions



Source: Upcoming ADB Last-Mile Digital Connectivity Working Paper

Step 2: Review options from existing solutions



Source: Upcoming ADB Last-Mile Digital Connectivity Working Paper

Step 2: Review options from existing solutions

Table 29: Access network options based on area and geographic features

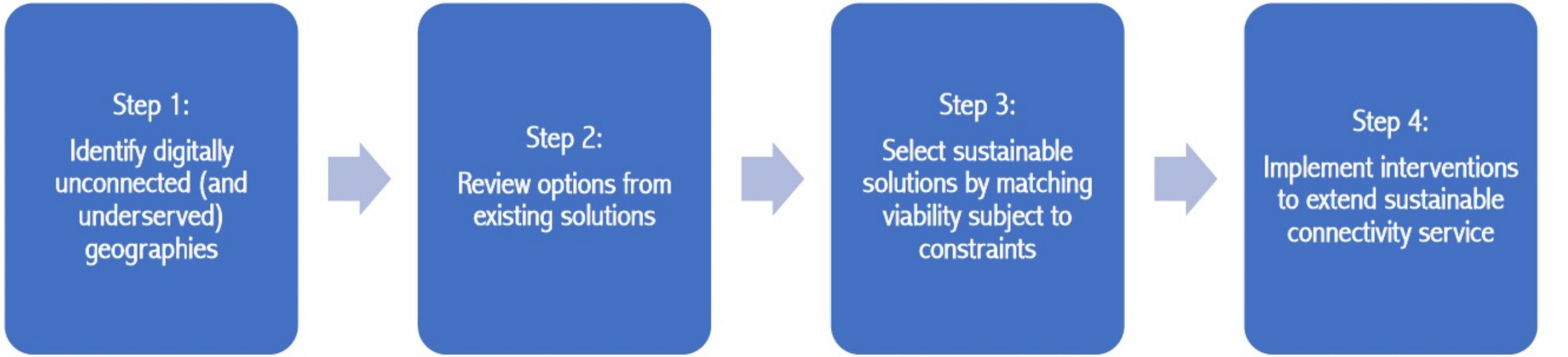
	Small geographic area, flat terrain	Small geographic area, mountainous terrain	Large geographic area, flat terrain	Large geographic area, mountainous terrain
Relative thresholds	< 10 square km; line of sight possible across most of the terrain	< 10 square km; non-line of sight across most of the terrain	> 10 square km; line of sight possible across most of the terrain	> 10 square km; non-line of sight across most of the terrain
Potential service options	Mesh network of Wi-Fi access points with point-to-point or point-to-multipoint links; cellular	Cellular, satellite	Wide area cellular or satellite solutions; microwave point-to-point or point-to-multipoint links in a wireless mesh	Wide area cellular or satellite solutions

Table 32: Sustainability considerations by organizational structure

	Commercial MNO	Commercial ISP	Not-for-profit local mobile network	Not-for-profit local ISP network
Sustainability considerations	Commercial operation that must break even (or provide coverage as a corporate social responsibility endeavour or coverage obligation requirement)	Commercial operation that must break even (or provide coverage as a corporate social responsibility endeavour or coverage obligation requirement)	Usage fees may have to be supplemented with in-kind contributions (network installation and operation) or ongoing community or government subsidies	Usage fees may have to be supplemented with in-kind contributions (network installation and operation) or ongoing community or government subsidies

Source: ITU Last Mile Internet Connectivity Solutions Guide 2021

Step 3-4: Selection and Implementation



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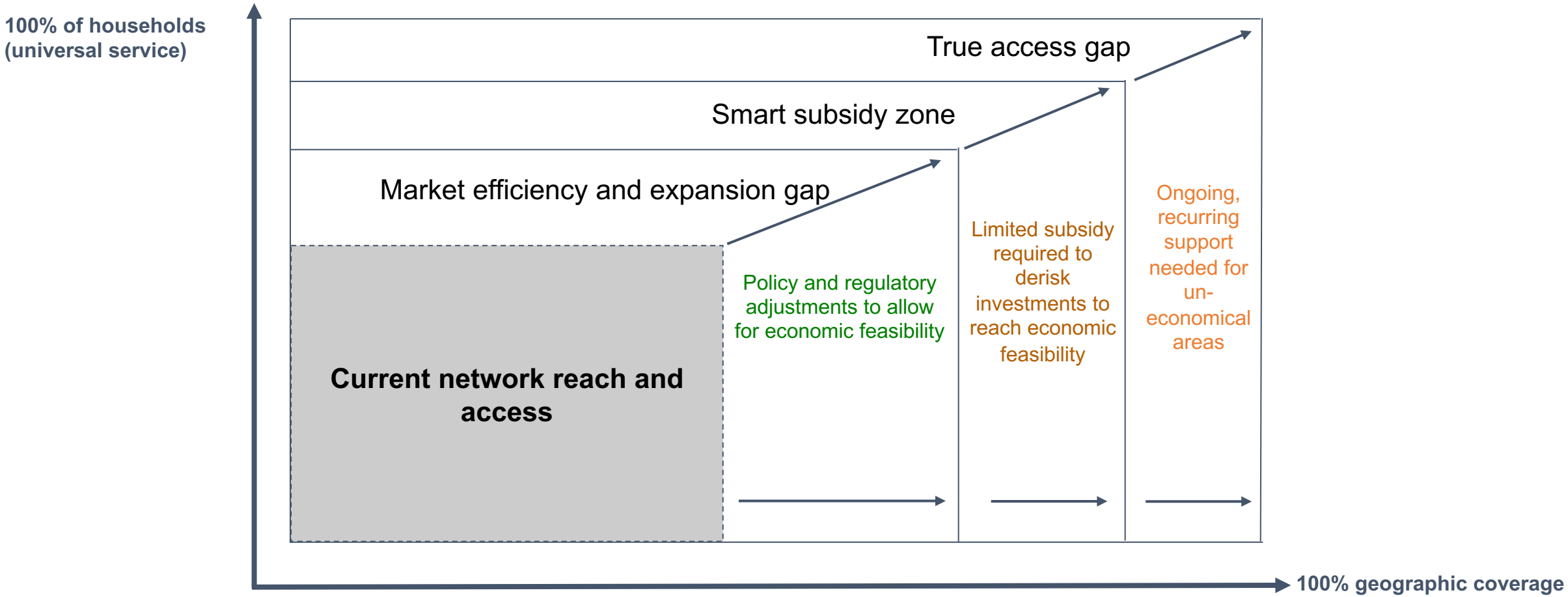
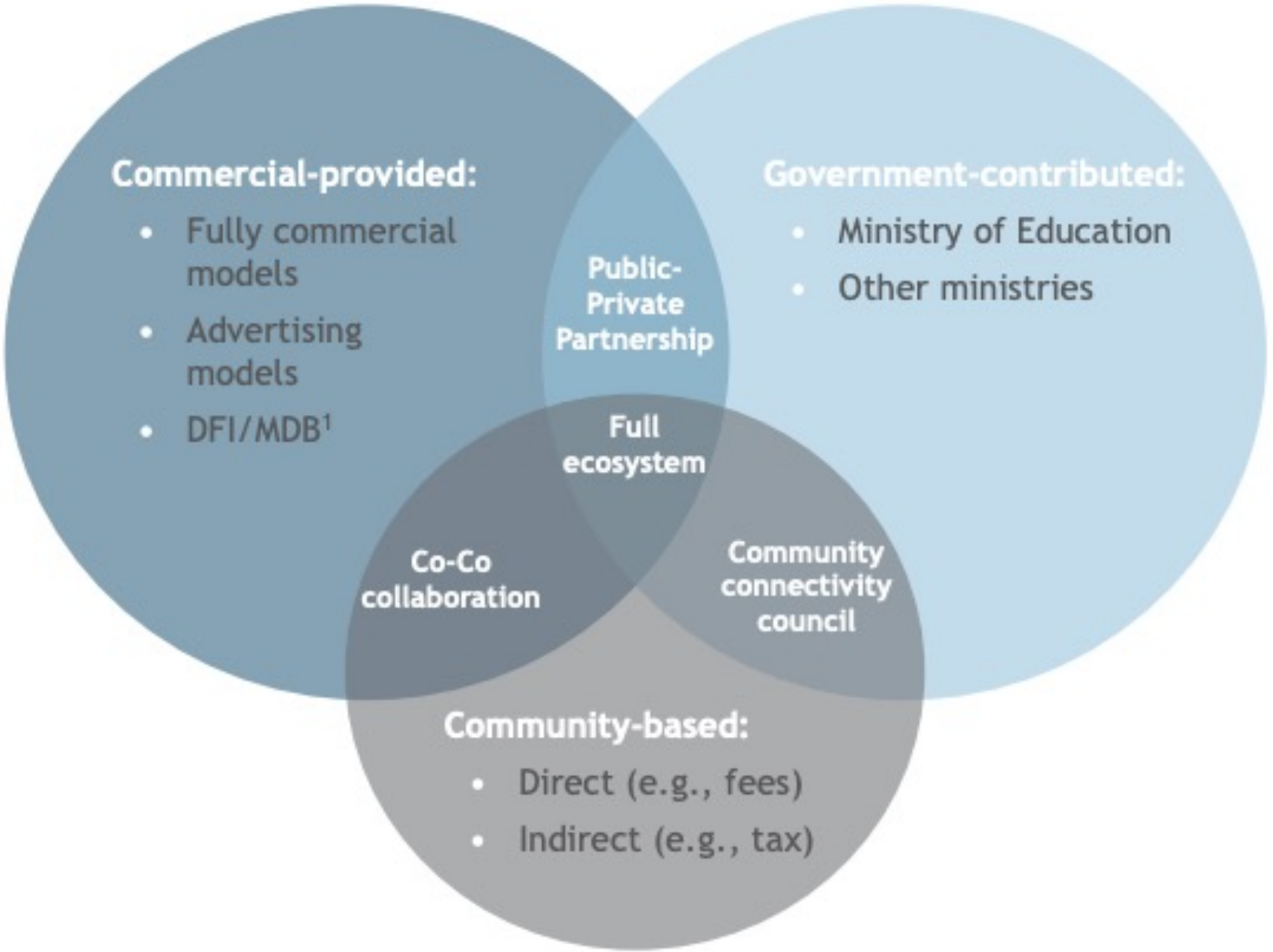
Different interventions needed for ‘different’ connectivity gaps



Source: Adapted from the ITU ICT Regulation Toolkit

Funding approaches



Source: BCG, Country Operating Models for School Connectivity

School Connectivity Options

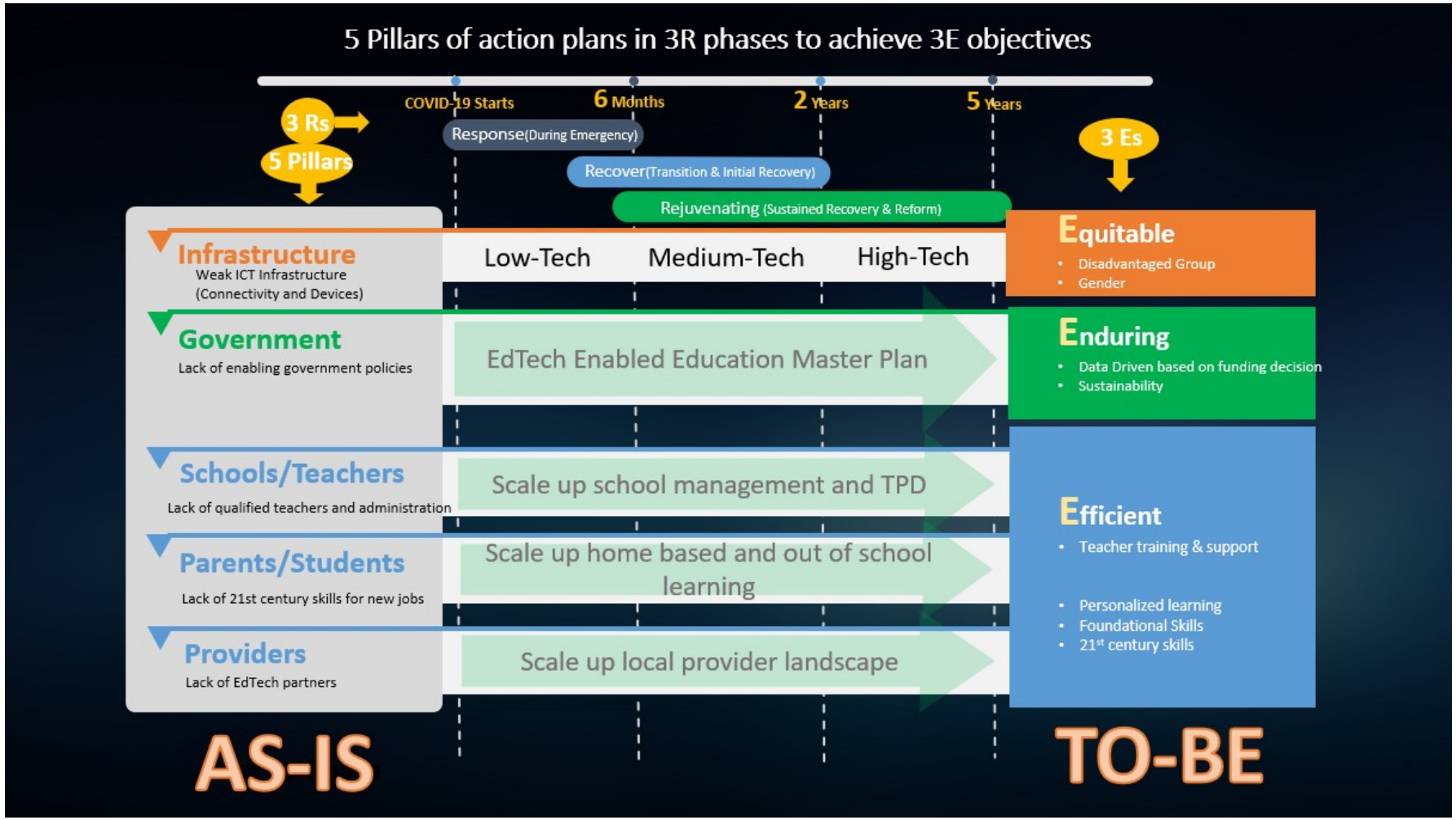
Model	Brief Description
E-Rates (Education Rates, also called preferential rates)	Consists of obtaining specially discounted rates for Internet Access for educational institutions. The government implements a way for schools to obtain a discount from commercial ISPs (generally 50%) off the standard market rates. There are several options to fund the discount. Schools typically still have to pay for the remaining part of the fee.
Creation of purchasing consortium (aggregation of bandwidth purchases or collective purchasing)	Groups of schools, usually aggregated by region, district, province or other geographical administrative units form a consortium to collectively buy bandwidth from commercial providers, obtaining some collective discount. The consortium can be created by schools themselves, local governments, NGOs or the central government. The consortium creator usually helps by providing guidance and technical assistance, leading negotiations with ISPs, providing initial administrative and financial support.
Creation of educational ISP (Internet Service Provider)	The government decides to set up a specific organisation (called an ISP) to provide discounted and/or free access for schools. This organization is either a government body or a separate organization, even a commercial one, partially funded y the state.
Market liberalization (or deregulation)	The process of lessening or removing government telecommunications regulations, leaving prices to be determined by market forces. A much more complex solution, it allows for free market competition which indirectly benefits new players, and results in new areas being covered and cheaper rates.

Source: UNESCO, School Connectivity Options Matrix, https://en.unesco.org/icted/sites/default/files/2019-04/school_connectivity_options_matrix.2.pdf

6. Recommendations to Countries

VI.

Recap the Country Planning Framework



Country Gaps and Opportunities for Improvements (1)

	Findings/gaps	Ideas for improvement	Digital principles
1	Schools lack connectivity, technical and training **capacity**. • lack of timely budgetary support for connectivity, equipment maintenance (replacements) and servicing. • lack of funding for technical support, user training, and capacity building.	• Develop mid to long term strategic sustainability plans that focus on "return on investment". • Support local capacity building in connectivity, technical servicing, support and user training.	Build for Sustainability Building sustainable programs, platforms and digital tools is essential to maintain user and stakeholder support, as well as to maximize long-term impact.

2	The general education system lacks robust digital **data collection** tools.
	• Gaps in data collection on:
	  • relevant, measurable outcomes
	  • school performance data
	  • behavioral data
	  • teaching and learning metrics useful for customizing learning
		• Develop a robust digital EMIS and data-driven school information system.
		• Integrate performance and behavioral data sources
		• provide due access to schools and teachers to help them customize and enhance student learning.
			Be Data Driven When an initiative is data driven, quality information is available to the right people when they need it, and they are using those data to take action.

Country Gaps and Opportunities for Improvements (2)

	Findings/gaps	Ideas for improvement	Digital principles
3	The current **curriculum** lacks focus on learning outcomes and does not seem to leverage the best digital standards and practices. Evidence shows: • The well-established systems, standards and principles are not being fully utilized. • The new systems currently under development conceptually resemble the old ones.	• Use and adapt established systems, tools and content freely available on world portals. Leapfrog mistakes by learning from other countries' experiences. • Draw upon the lessons learnt from the previous projects in creating new ones. Utilize the internationally accepted digital principles.	Use Open Standards, Open Data, Open Source, and Open Innovation An open approach to digital development can help to increase collaboration in the digital development community and avoid duplicating work that has already been done.
4	Education communities of practice have formed online (e.g. Telegram, Facebook). There seems to be a lack of **collaboration** with these online communities. • *~90% of teachers who use Telegram use it to share ideas, learning content and discuss education topics.*	• Nurture communities of practice, share data/information, create joint projects with them. • Foster teacher interactions to support mentorship and collaboration for improvement of learning outcomes.	Be Collaborative Being collaborative means sharing information, insights, strategies and resources across projects, organizations and sectors, leading to increased efficiency and impact.

Summary of recommendations

1. EdTech is not for the sake of technology, it's about education and about learning.

2. Each EdTech project needs to consider alignment among different pillars of the ecosystem

3. EdTech master plan integrated into education sector plan

4. Make Project Assessment evidence-based , output driven as opposed to input driven

Key Takeaways – Digital Connectivity

1. Seize the unprecedented interest in closing the digital divide

2. Ensure that school connectivity-related goals are included in the broader recovery plan

3. Effective yet flexible sectoral regulations (spectrum, licensing) are key for LMC.

4. Cross-sectoral collaboration may open new opportunities

5. Look for opportunities to aggregate demand

Transforming Teaching & Learning in School Education with Education Technology Platforms

Thank you!

Cost Effective Formative Assessment With Double Teacher Modality

In-class student learning outcome data with a 5-dollar clicker assigned to each student – Speech recognition empowered - Used with over 10 million students in China

Breakout Session

Each team discuss and decide among your team:

1. What are the key issues/challenges your country faces short term and longer term?
2. For each issue/challenge, what are the possible areas of improvement opportunities that utilize Education Technology