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Economic and Social Commission for Asia and the Pacific
Information Note (Draft)
Subregional Workshop on ICT Co-deployment along Passive Infrastructure in South Asia, New Delhi, India, 27 June 2019.

Subregional cooperation for ICT Co-deployment along Passive Infrastructure in South Asia

Summary

The document provides an overview of the state of broadband connectivity in South Asian countries. Based on the current status of broadband connectivity, the information note identifies potential corridors for subregional cooperation on strengthening cross-border connectivity. In addition, the note provides a summary of ESCAP's regional cooperation initiative—Asia-Pacific Information Superhighway (AP-IS)—which supports ESCAP member States and other stakeholders on promoting cross-border broadband connectivity. The document is prepared for the *"Subregional Workshop on ICT Co-deployment along Passive Infrastructure in South Asia"*, New Delhi, India, 27 June 2019.

Contents

Introduction

This information note was prepared to provide useful information to participants attending the Subregional Workshop on ICT Co-deployment along Passive Infrastructure in South Asia, New Delhi, India, 27 June 2019.

The objective of the subregional meeting is to raise awareness and facilitate constructive dialogue between government officials responsible for ICT and Transport respectively on opportunities and challenges for implementing policies on cross-border infrastructure co-deployment, in addition, to discuss the policy implications of cross-border ICT co-deployment on national and regional legislative and regulatory frameworks.

The information note has eight sections with section one examining the status of broadband connectivity in South and South-West Asia (national level). The analysis uses data from ITU to assess the level of broadband (fixed and/or mobile) access, affordability, network coverage, and capacity (Internet bandwidth) of each country in South and South-West Asia.

Sections two, three and four outline the level of broadband connectivity between neighbouring countries in the subregion, including the Northeastern Indian States, Bangladesh and Bhutan corridor; Nepal, India, Bhutan and Bangladesh corridor; and Afghanistan and Pakistan corridor, while other corridors will be proposed and considered at a later stage

Section five discusses the merits of ICT infrastructure co-deployment through passive infrastructures (such as roads, railways and power grids), as a potential option towards strengthening the access to affordable broadband access between countries in the subregion.

Section six, seven and eight summarises the key issues of the information note, discusses the role of the regional cooperation through the Asia-Pacific Information Superhighway (AP-IS) initiative in promoting subregional access to affordable broadband Internet, identifying cooperation opportunities between ICT and Transport sectors and outlining the way forward.

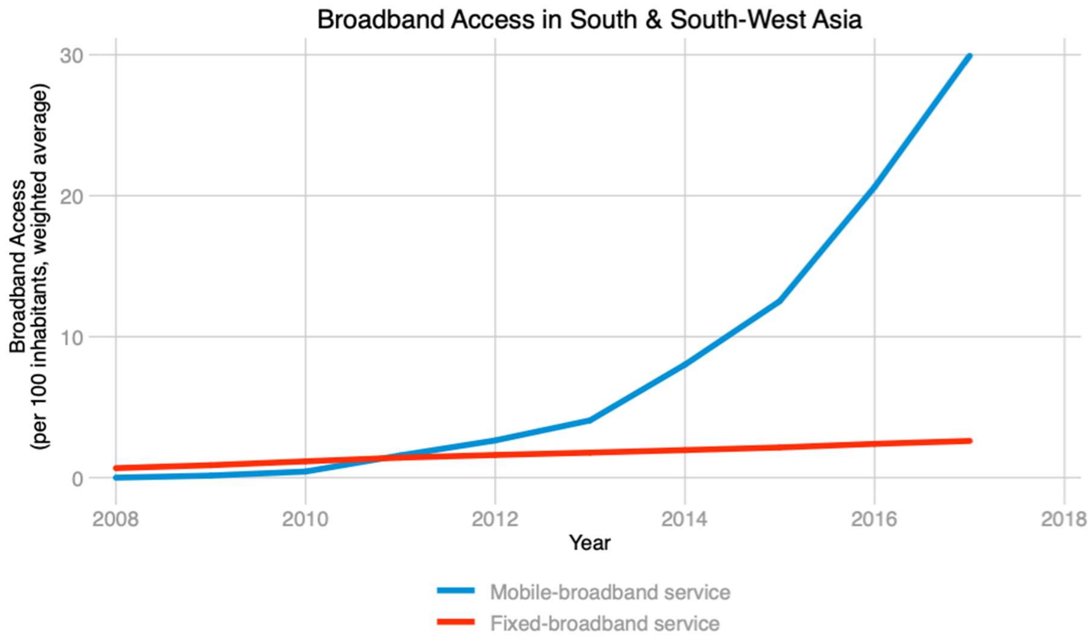
Broadband connectivity in South and South-West Asia

Recent ITU statistics for South and South-West Asia show that while broadband connectivity in the subregion has improved over time, adoption rates between fixed-broadband and mobile-broadband subscriptions vary considerably (Figure 1). Mobile-broadband subscriptions adoption in the subregion has grown at an annual average rate of 58 per cent over the last decade, while fixed-broadband has grown at an annual average of 25 per cent. The high growth rate in the mobile-broadband subscriptions is also evident in other Asia-Pacific subregions,[1] due to various factors.[2] These factors include rapid ICT sector growth in the region's developing countries and regulatory policy reforms such as introduction of competition, establishment of an independent regulator and privatization of state-owned enterprises leading to increased private investment. The subregion's statistics reflect that while adoption of fixed-broadband subscriptions improved in the last decade, the adoption rate, in 2017, remained low at around 3 per cent.

[1] https://www.unescap.org/publications/artificial-intelligence-and-broadband-divide-state-ict-connectivity-asia-and-pacific

[2] https://www.unescap.org/resources/broadband-connectivity-pacific-island-countries

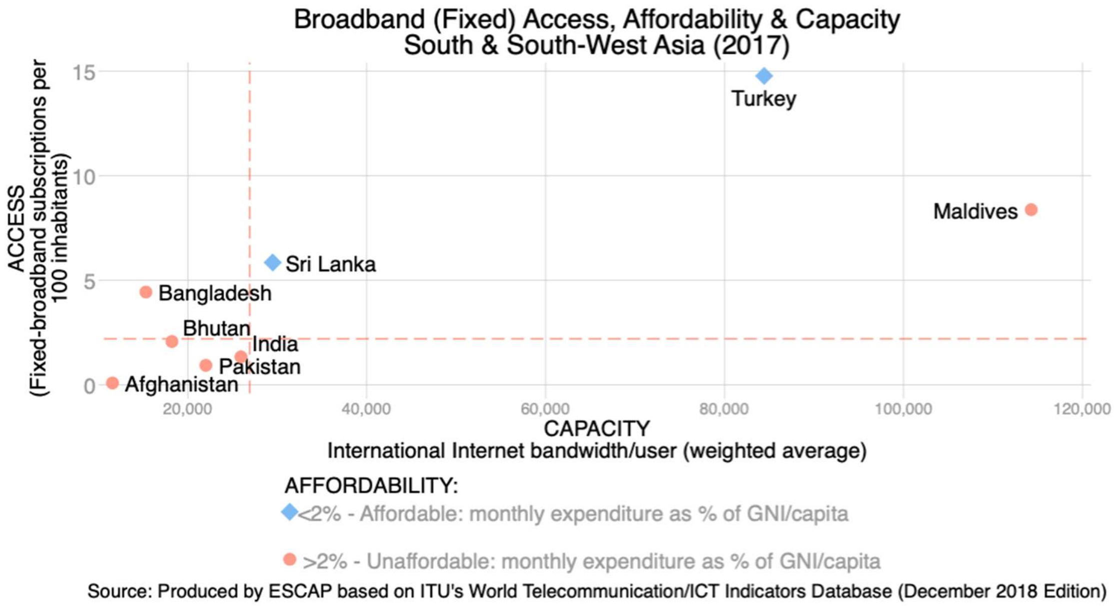
Figure 1:



Source: Produced by ESCAP based on ITU's World Telecommunication/ICT Indicators Database (December 2018 Edition)

Access to fixed-broadband connectivity between countries in South and South-West Asia varies significantly (Figure 2). The Maldives has the highest fixed-broadband capacity (international Internet bandwidth per user) compared to other countries in the subregion. However, fixed-broadband service in the Maldives is still considered unaffordable (monthly expenditure as a percentage of GNI per capita is higher than 2 percent). On the other hand, Sri Lanka is considered to have affordable fixed-broadband subscriptions with good access and capacity (second only to Maldives and Turkey).

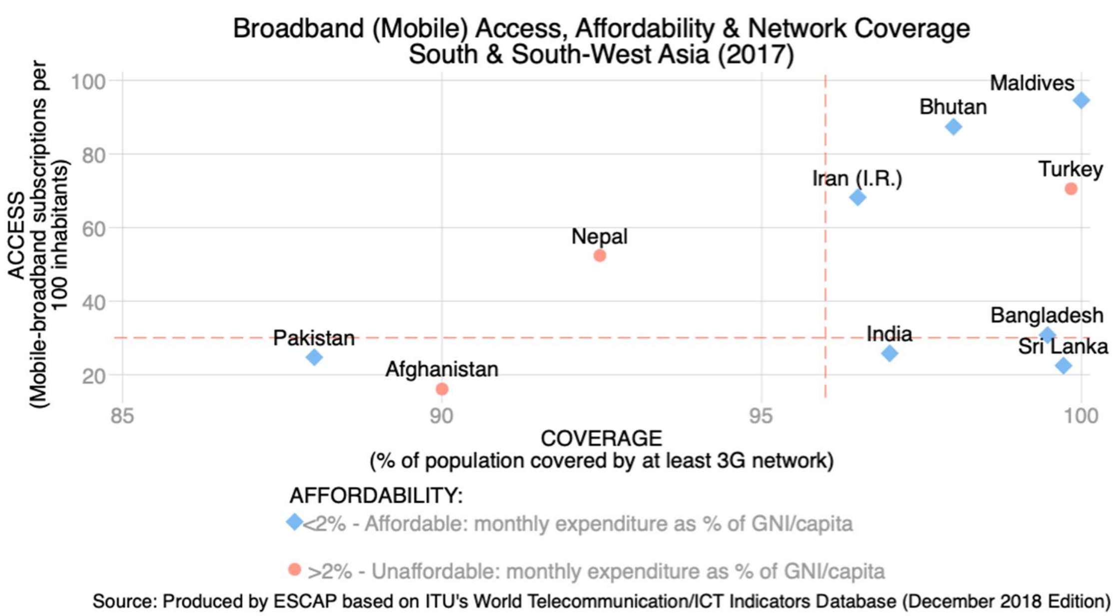
Figure 2:



The dotted line indicates the weighted average of the countries' sample for the variable of interest

Mobile-broadband subscriptions are considered affordable for seven out of 10 countries in the subregion (Figure 3). On the one hand, the Maldives has the highest access, coverage and considered affordable. On the other hand, Pakistan has the lowest mobile-broadband access and network coverage in the subregion, although the mobile-broadband service in Pakistan is considered affordable.

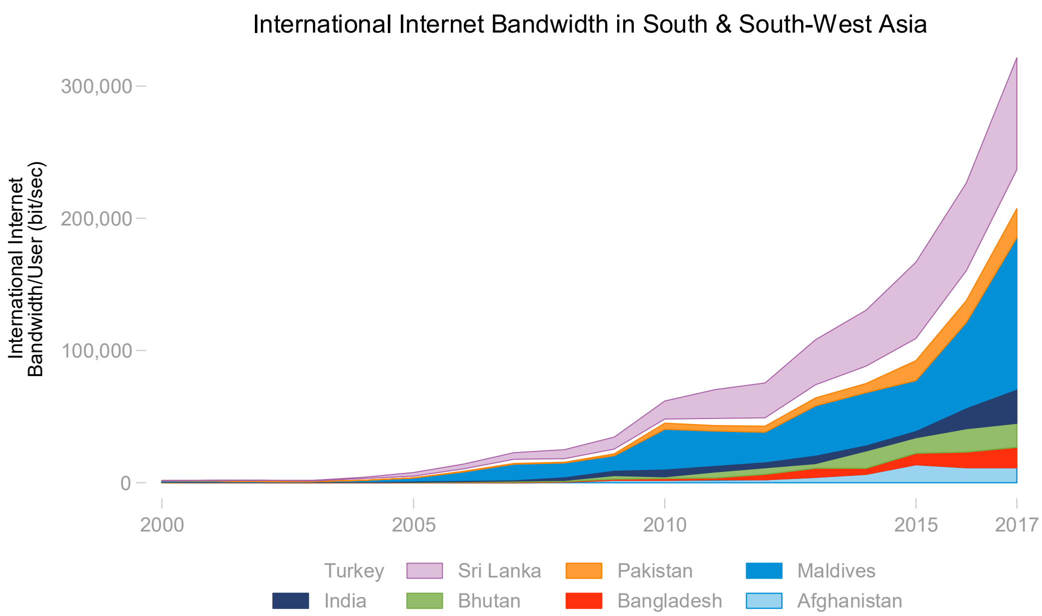
Figure 3:



The dotted line indicates the weighted average of the countries' sample for the variable of interest

While access to affordable broadband connectivity continues to be an essential policy challenge for countries in South and South-West Asia, existing and future demand for higher international Internet bandwidth (Figure 4) will continue to put pressure on the existing ICT infrastructure. In the last decade, the demand for international Internet bandwidth in the South and South-West Asia has increased exponentially, driven by strong per capita bandwidth demand from the Maldives and Sri Lanka.

Figure 4:



Source: Produced by ESCAP based on ITU's World Telecommunication/ICT Indicators (December 2018 Edition)

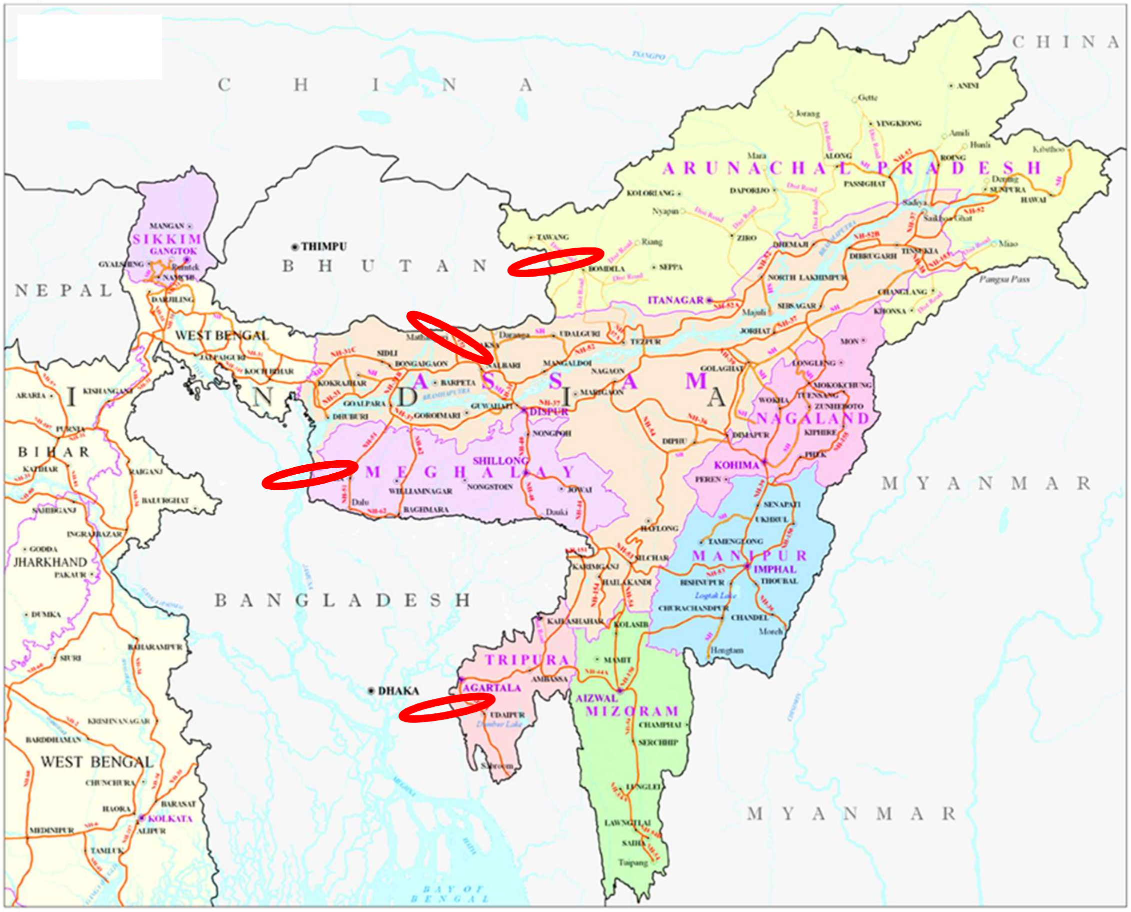
Rapidly increasing use of bandwidth-intensive Industry 4.0 technologies, such as Artificial Intelligence, social media, big data and Internet of Things, will require additional bandwidth. Availability of excess international Internet bandwidth will, therefore, create an opportunity to meet the increasing demand for bandwidth once national backbones and last mile connectivity issues are addressed. The utilization of available bandwidth could also be considered for cross-border collaboration between some countries of the subregion to maximize the use and generate additional revenue.

Northeastern Indian States-Bangladesh-Bhutan Corridor

One opportunity lies between the several Northeastern Indian States bordering Bangladesh, Nepal and Bhutan respectively (Map 1). Improving cross-border connectivity between Northeastern Indian States and the neighbouring South Asian countries could facilitate increased access to international Internet bandwidth which is crucial for the growth of emerging technologies, smart cities, transportation systems, and e-commerce for sustainable development. For example, the Northeastern Indian States of Arunachal Pradesh and Assam could strengthen its cross-border broadband connectivity with Bhutan and vice-versa. Also, the cross-border broadband connectivity between Bangladesh and the Northeastern Indian States of Meghalaya and Tripura can be enhanced. Tripura's capital city of Agartala, is currently

connected to Bangladesh through Cox's Bazar.[3] The Northeastern Indian State of Sikkim can strengthen cross-border broadband connectivity with Bhutan.

Map 1:



Source: Source: India Ministry of Development of North Eastern Region, available from: https://mdoner.gov.in/infrastructure/road-map-only-nh- (accessed 7 May 2019).

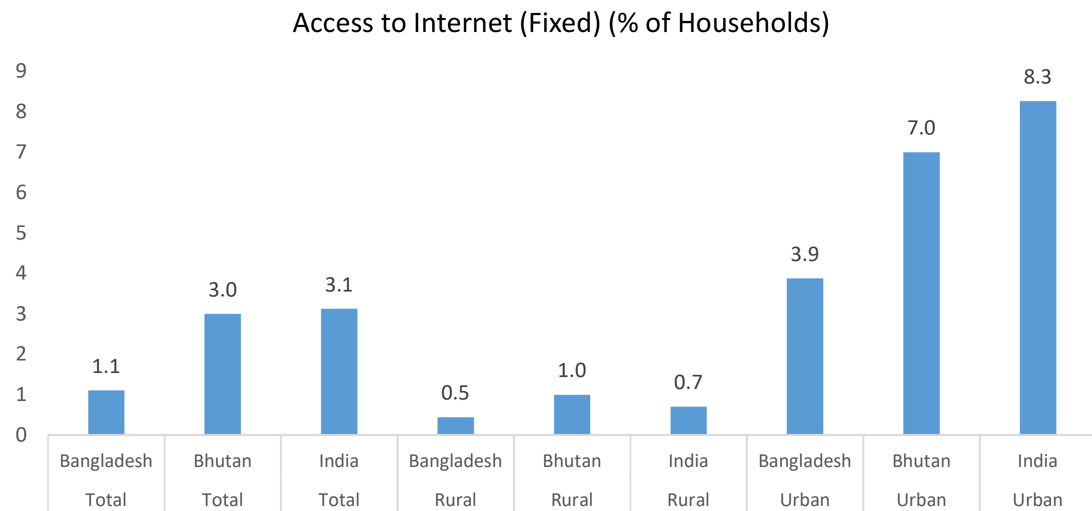
As mentioned earlier, while Internet (fixed) connectivity at the national level can be examined using country-level data, Internet connectivity at the state-level can be examined using household-level data from population census of these countries. As a result, statistics on access to the Internet (fixed) and mobile phones has been extracted from the respective countries' population census survey. Attempts have been made to extract survey data for a common year for the four countries. As a result, household data for surveys conducted in 2011 was adopted except for Bhutan (2017). While 2011 data may be considered outdated, annual growth of access to the Internet (fixed) connectivity in these countries has changed little over time (see Figure 1 on Fixed-broadband trend line). In addition, it should be noted that the Internet connectivity for Nepal was recorded prior to the 2012 earthquake that significantly affected the telecommunication infrastructure in the country.

As a benchmark, we examined the Internet access of households as a percentage of total households at the country-level of the three countries in this proposed corridor (Figure 5).

[3] https://telecom.economictimes.indiatimes.com/news/policy/foundation-for-indo-bangladesh-telecom-link-laid-in-tripura/48034267

Bhutan and India have similar Internet access levels (3 percentage of total households), while Bangladesh is slightly lower at 1 percentage. In all three countries, urban households have higher access to the Internet compared to rural households.

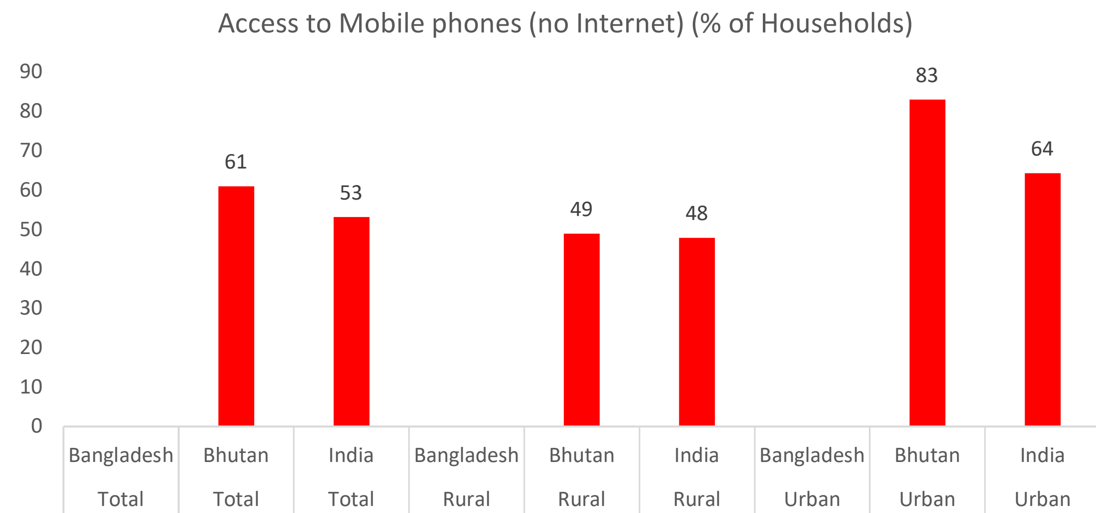
Figure 5:



Sources: Nepal National Population and Housing Census 2011, National Report, available from: https://unstats.un.org/unsd/demographic-social/census/documents/Nepal/Nepal-Census-2011-Vol1.pdf (accessed 15 May 2019); Bhutan Population & Housing Census 2017, National Report, available from: http://www.nsb.gov.bt/publication/files/PHCB2017_national.pdf (accessed 15 May 2019); Bangladesh Population and Housing Census 2011, Socio-Economic and Demographic Report, available from: http://bbs.dhaka.gov.bd/sites/default/files/files/bbs.dhaka.gov.bd/law_policy/6ed6b42c_2015_11e7_8f57_286ed488c766/Socio-Economic%20and%20demographic%20Report%202012.pdf (accessed 15 May 2019); and India Census Digital Library (Online Database), Ministry of Home Affairs, Government of India, available from: http://censusindia.gov.in/DigitalLibrary/Tables.aspx (accessed 15 May 2019).

Compared to fixed Internet connectivity, access to mobile phones is more common as more than half of the total number of households in India and Bhutan (no data was available for Bangladesh) have access to mobile phones (Figure 6). Compared to rural households, urban households have higher access to mobile phones. Despite these rural-urban disparities, there is significant portion of the rural households have access to mobile phones (48 per cent in India and 49 per cent in Bhutan).

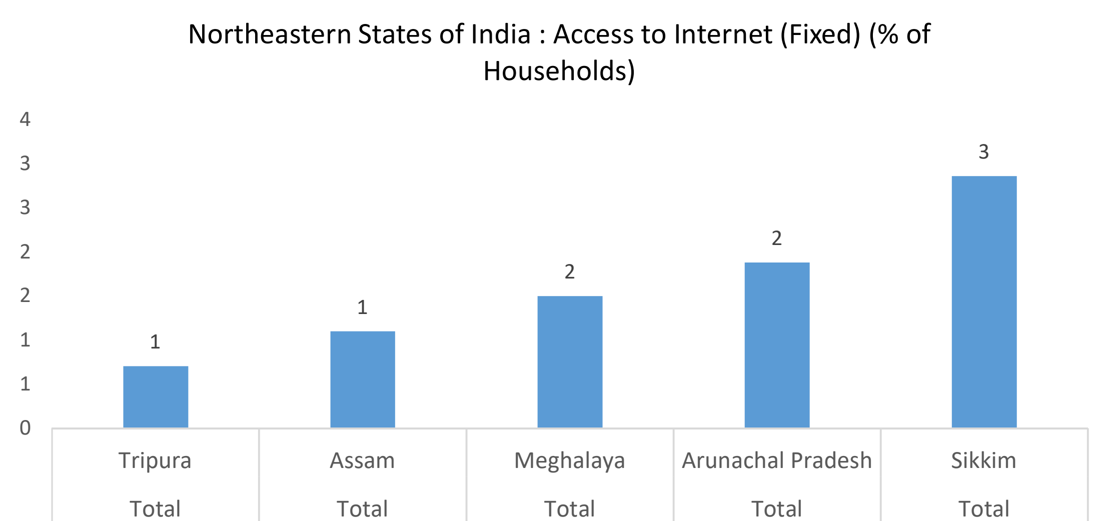
Figure 6:



Source: As in Figure 5.

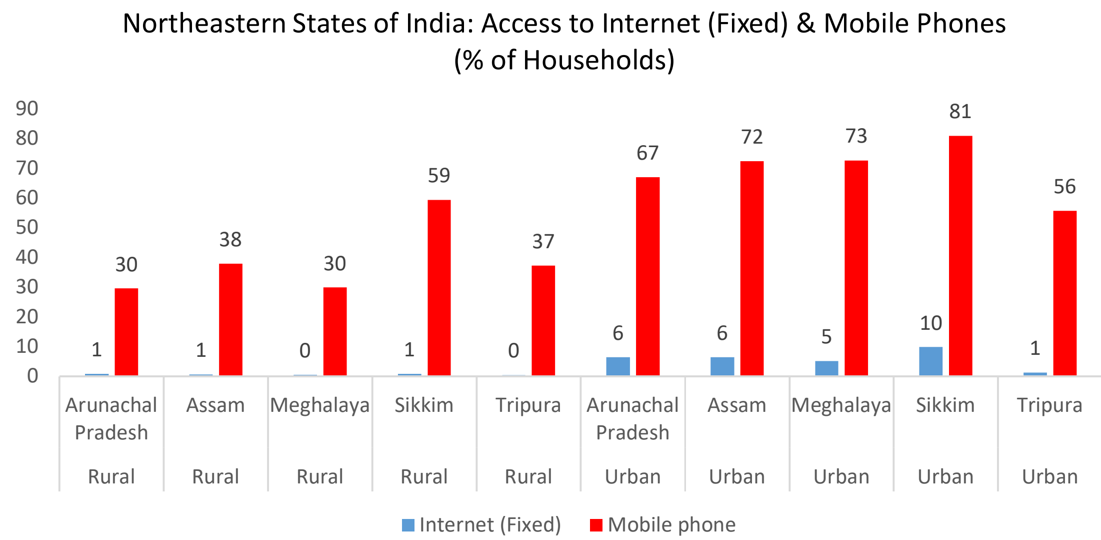
In the case of Northeast Indian states bordering with Bangladesh, Bhutan and India, access of households to the Internet (fixed) are significantly lower (except Sikkim) than the national average (3.1 percentage) for the States of Tripura, Assam, Meghalaya, and Arunachal Pradesh (Figure 7). However, access to mobile phones is much higher at the household-level in these States, with access to urban areas much higher than rural (Figure 8).

Figure 7:



Source: As in Figure 5.

Figure 8:



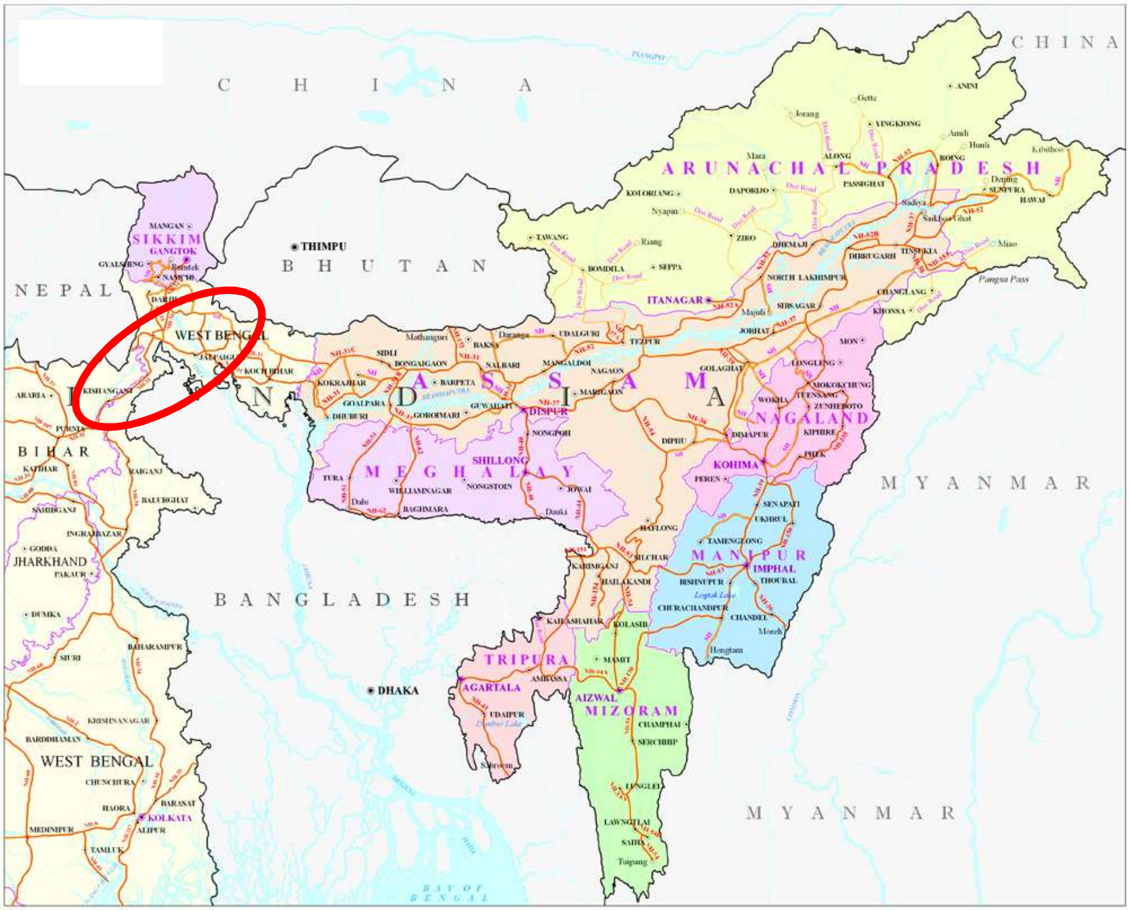
Source: As in Figure 5.

The household-level data provide useful insights on the Internet (fixed) connectivity between the countries in this proposed corridor. The low level of Internet access at the household-level indicates that there is a significant opportunity for cross-border connectivity between the respective Northeastern Indian States and neighbouring countries.

India-Bangladesh-Nepal-Bhutan Corridor

Another opportunity lies between India, Bangladesh, Nepal and Bhutan (Map 2). Known as the 'Chicken's Neck' is a narrow stretch of land in the Indian State of West Bengal, which connects India's Northeastern States to Nepal, Bangladesh and Bhutan. Rangpur Division (Bangladesh), the Eastern Development Region (Nepal), and Samtse Province (Bhutan) are the geographically closest to the Chicken's Neck.

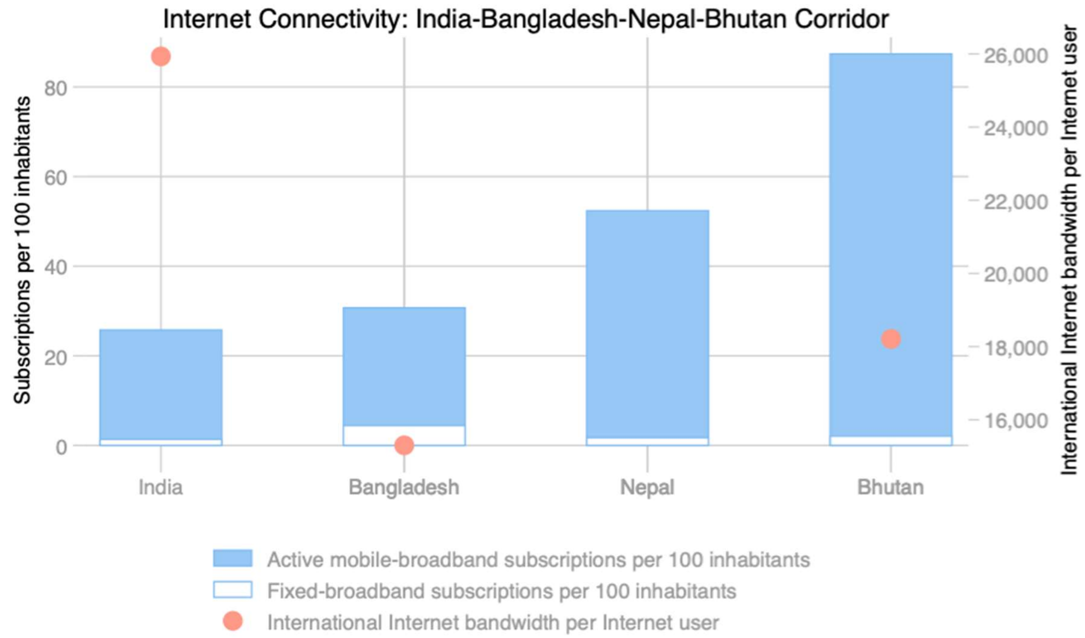
Map 2:



Source: India Ministry of Development of North Eastern Region, available from: https://mdoner.gov.in/infrastructure/road-map-only-nh- (accessed 7 May 2019).

When it comes to Internet bandwidth availability, India has the highest international Internet bandwidth per user compared to Bangladesh and Bhutan, however, India has the lowest rate of access to broadband Internet connectivity of the four countries (Figure 4). This anecdotal evidence shows that there is access international Internet bandwidth in India that could be exported to the neighboring countries. (Figure 9). Countries along this corridor could further boost their respective bandwidth capacities through the deployment of new cross-border fiber optic cables between countries.

Figure 9:



Source:Produced by ESCAP based on ITU's
World Telecommunication/ICT Indicators Database (December 2018 Edition)

Moreover, when looking at the ICT connectivity of the four States/Provinces/Districts in this corridor, all Internet users (as a percentage of the total population in these respective States) are below their respective national rates (Table 1). For example, the Eastern Development Region of Nepal has 0.3 percent of Internet users in the region compared to the average national rate of 9 percent (30 times lower than the national average). In the case of Bangladesh and Bhutan, Internet user rates in those respective States are 31 and 27 times lower than the national averages. In the case of India, Internet users in the State of West Bengal (2 per cent) are 5 times lower than the average national rate (10 per cent).

Similarly, all three States/Provinces/Districts of Eastern Development Region (Nepal), West Bengal (India) and Samtse Province (Bhutan) have mobile-cellular subscription rates lower than the national averages (except for Rangpur Division due to lack of data). As a result, there is an opportunity for the countries (and, the relevant States/Provinces/Districts) in this corridor to improve ICT connectivity through the strengthening of cross-border connectivity to increase international Internet bandwidth.

Table 1:
India-Bangladesh-Nepal-Bhutan Corridor – ICT connectivity by State/Region/District

	Internet Users (% of total)	Fixed-telephone Users (% of total)	Mobile-cellular Users (% of total)	Population
Eastern Development Region - Nepal	0.3	1	13	5,811,555
Nepal	9	3	49	27,327,147
Rangpur Division - Bangladesh	0.1	..	..	15,434,619
Bangladesh	5	0.6	55	153,911,916
West Bengal - India	2	6	47	91,276,115
India	10	3	72	1,247,236,029
Samtse Province - Bhutan	1	1	30	66,459
Bhutan	14	4	65	740,510

Sources: State/Region/Province/Division data were extracted from national census data of respective countries in 2011 (latest available data for comparison in all countries of interest of key ICT variables), including India Registrar General & Census Commissioner, 'Census of India 2011', available from: http://www.censusindia.gov.in/2011Census/pes/Pesreport.pdf (accessed 7 May 2019); Bangladesh Bureau of Statistics, 'Population and Housing Census 2011', Socio-Economic and Demographic Report', National Series, Volume 4, available from: http://catalog.ihsn.org/index.php/catalog/4376/download/56816 (accessed 7 May 2019); Bhutan National Statistics Bureau, 'Annual Dzongkhag Statistics 2011 – Samtse', available from: http://www.nsb.gov.bt/publication/files/pub5fs6025st.pdf (accessed 7 May 2019); and Nepal Central Bureau of Statistics, 'National Population and Housing Census 2011', National Report, Volume 1, available from: https://unstats.un.org/unsd/demographic-social/census/documents/Nepal/Nepal-Census-2011-Vol1.pdf (accessed 7 May 2019). National ICT statistics for the selected countries were extracted from ITU's World Telecommunication/ICT Indicators database (December 2018 Edition), available from: https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx

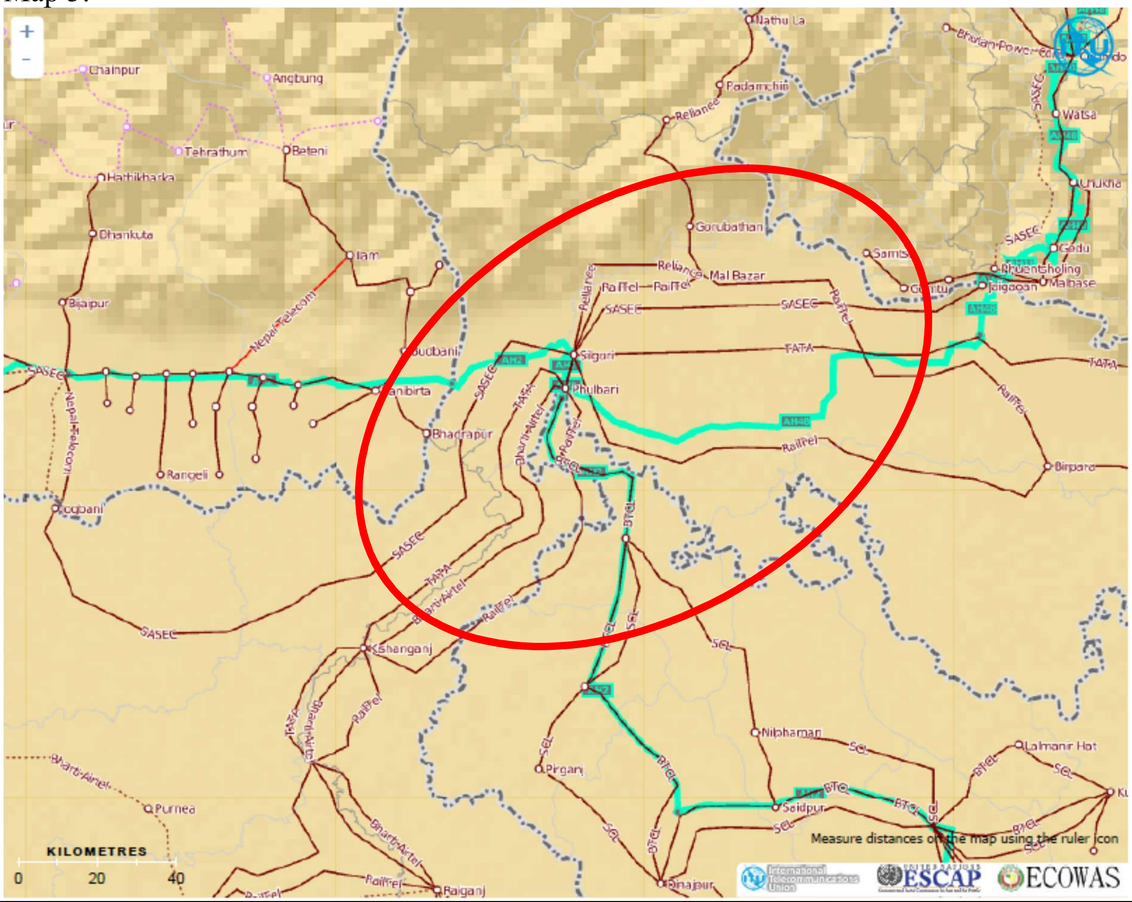
Currently, there are existing terrestrial fiber optic cables that connect countries in this corridor (Map 3). According to the ESCAP-ITU online transmission map, the following fiber optic cables exist:

1. BTCL (Bangladesh) connects to RailTel (India);
2. SASEC (India) connects to Nepal Telecom (Nepal);
3. SASEC (India) connects to Bhutan;
4. RailTel (India) connects to Bhutan (Phuntsholing & Gelephu respectively);

Feasibility of connectivity (through West Bengal, India) between Bangladesh and Bhutan is being explored. Map 3 also indicates the route of the Asian Highway (green colour line). The Asian Highway connects all four countries along this corridor. As a result, there is an opportunity for cross-border fiber optic co-deployment along the Asian-Highway in this corridor. Co-deployment of fiber optic cables along passive infrastructures (such as roads and railways) have been found to reduce infrastructure development costs, [4] co-deployment for e-resilience,[5] facilitate timely completion of projects through right of ways already made available through the ESCAP's Asian Highway Agreement,[6] and leveraging the synergies between ICT connectivity and transport systems—Intelligence Transport Systems.[7]

[4] https://www.unescap.org/resources/study-cost-benefit-analysis-fibre-optic-co-deployment-asian-highway-connectivity
[5] https://www.unescap.org/resources/co-deployment-optical-fibre-cables-along-asian-highways-and-trans-asian-railways-e
[6] https://www.unescap.org/resources/intergovernmental-agreement-asian-highway-network
[7] https://www.unescap.org/resources/road-safety-infrastructure-its

Map 3:



Source: ESCAP-ITU Interactive Terrestrial Map, available from: https://www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway/asia-pacific-information-superhighway-maps (accessed 7 May 2019)

Afghanistan-Pakistan Corridor

There are other opportunities for cross-border connectivity between countries in the subregion. These opportunities include strengthening the cross-border ICT connectivity between Afghanistan and Pakistan. The widening digital divide remains a considerable development challenge in these countries. The latest ITU statistics on access to mobile-broadband connectivity indicated that only 14 per cent of citizens in Afghanistan while 20 per cent in Pakistan had access to mobile broadband subscriptions. Fixed broadband subscriptions are also significantly lower (Table 2). Countries with higher access to broadband subscriptions (both mobile and fixed) also have more affordable services (prices as a percentage of GNI). Generally, in these countries, there is a positive correlation between increased access to affordable broadband connectivity and overall progress on sustainable development.

Table 2:

Indicator	**Afghanistan**	**Pakistan**
Social/economic/ environment		
Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)	..	6.1*
GNI per capita (constant 2010 US$)	625	1,251
GDP per capita (constant 2010 US$)	618	1,178*
Life expectancy at birth, total (years)	63.7	66.5
Literacy rate, adult female (% of females aged 15 and above)	17*	44*
Literacy rate, adult male (% of males aged 15 and above)	45*	69*
Renewable electricity output (% of total electricity output)	85*	62*
Access to electricity (% of population)	84	99
Population (million)	33	191
ICT		
Mobile phone subscriptions (per 100 inhabitants)	14	20
Fixed broadband subscriptions (per 100 inhabitants)	0.03	0.9
Fixed broadband prices/month (% of GNI per capita)	29	5
Mobile phone prices/month (% of GNI per capita)	9.4	2

Source: World Development Indicators, http://databank.worldbank.org/data/reports.aspx?source=World-Development-Indicators# (accessed 4 June 2018) & ITU, World Telecommunication/ICT Indicators Database 2017, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx
Note: *- Latest data available

Progress on broadband infrastructure development in the selected countries has been rather slow. The ESCAP and other research institutions have conducted extensive analysis on this issue and indicated that the reasons for such slow progress include unaffordable broadband prices; lack of national and subregional broadband networks; limited institutional and human capacity; outdated policies and regulations; and a lack of electronic content and e-services that could lead to sustainable development practices. Since the Internet requires access to regional

and global networks, establishing direct network connectivity with the neighboring countries is also critical to increase broadband availability and services, and to reduce price of Internet connectivity within and between these countries.

Co-deployment of ICT along Passive Infrastructures

To bridge the digital divide, expansion of ICT infrastructure is a priority, especially for countries that lag behind. Unfortunately, the costs of investing in such infrastructure generally pose a considerable budget pressure on government and private sectors respectively. Under such circumstance, infrastructure co-deployment is a key solution to accelerate the development of ICT infrastructure by leveraging synergies that could be brought in across other infrastructure sectors.

Although the concept of infrastructure co-deployment is not new, not all the countries in the region are capitalizing on such opportunities and have placed it in actual development plan and implementation agenda.

Fibre optic cable (FOC) is a network cable that holds strands of very thin, pure glass fibers inside an insulated casing, designed as a waveguide for carrying communication signals using pulses of light generated by small lasers or light-emitting diodes (LEDs). It provides a very high-performance data networking, and due to its flexibility and bundling as cables, it is used as a medium for telecommunication and computer networking. Compared to traditional copper-wired cables, FOC provides higher amount of network bandwidth, has the ability to transmit data over longer distances without losing strength, and is less vulnerable to interference. FOC thus supports much of the world's Internet, cable television, telephone, and other communication systems.

FOC network, by nature, can be deployed and extended along other infrastructures and utilities including highways, railways, electric transmission lines and power grids, water pipelines, drainage and sewage system, oil and gas pipelines, etc. As such, integrated planning, design and implementation of FOC co-deployment will give opportunities for minimizing overall cost and time of provisioning, reducing disruptions as a result of repeated civil works and streamlining maintenance and repairs, while providing revenue generating opportunities to other sectors such as road authorities.

Installation of FOCs along highways or roads serves a wide range of complimentary purposes which benefits not only the telecom operators in terms of extension of broadband backbone network but also the transport entities that require high-speed broadband for their own transport system and management. FOC network constitutes an important element for highway communication system and service delivery including traffic data and image transmission, traffic monitoring and control, toll system. Given its ability to transfer high speed data, FOCs are also a key building block of Intelligent Transport System (ITS) and other smart transport applications. During the design and construction of highways/roads, transport entities may opt to concomitantly lay FOCs for such internal demand and install additional FOCs or at least additional ducts that can be leased subsequently, which would contribute to the ICT backbone extension.

An ESCAP report on co-deployment in the Republic of Korea,[8] highlighted that co-deployment of FOCs along highways began in early 1990s by the highway entities; specifically, Korean Express Corporation (KEC) installed its first FOC network during the construction of the 320-kilometer expressway around Seoul Metropolitan Area for the purpose of setting up Freeway Traffic Management System (FTMS). Subsequently, the construction and installation through co-deployment continue progressively, and in 2017, the total length of FOCs along highway in the Republic of Korea reaches 12,400 kilometers, of which 4,700 kilometers are expressways and 7,700 kilometers are major arterial highways.

In India, telecom sector is among the fastest-growing sectors. Over years, through a national fibre optic cable network (*BharatNet)*, the country has developed a strong telecom infrastructure network with an effort to transform the country into a global telecom hub. As of the first quarter of 2018, FOCs have been laid for around 272,137-kilometer (115,356 Gram Panchayats or villages) distance, with average weekly deployment of 740 kilometers long.

However, the FOC co-deployment along the road infrastructure only initiated lately in some new road construction projects in states like Chhattisgarh.[9] Most of the roads and highways in India that have FOCs running alongside are deployed by state-owned or private telecom service providers only after the construction of the roads and railway tracks. Telecom operators thus bear costs of deploying the FOCs as a result of overlapping civil engineering work and dealing with several issues ranging from planning to negotiating and getting multiple right-of-way (RoW) permissions for the deployment. The costs could be reduced significantly if it is incorporated as the requirement into the design of road construction. The synergic design would bring in enormous operational and cost efficiency, considering such nationwide road infrastructure project in hand.

An analysis of Myanmar[10] highlighted significant cost savings for FOC co-deployment. Figure 5 shows the cost saving calculated by comparing co-deployment with separated deployment cases. The cost of two-way separated deployment is USD 12,984 per kilometer, while that of two-way co-deployment is only USD 5,605 per kilometer. Thus, co-deployment can save 56.8 per cent. Similarly, in four-way FOC co-deployment case, USD 10,047 cost could be saved per kilometer, representing 54.1 per cent of the cost of separated deployment. It is found that such large cost savings derive from earthwork which constitutes the largest cost component of duct deployment. The saving would be higher if considering potential implicit costs such as seeking construction permission, changes in the construction period, traffic control and demanding night work due to daytime traffic in the case of separated deployment.

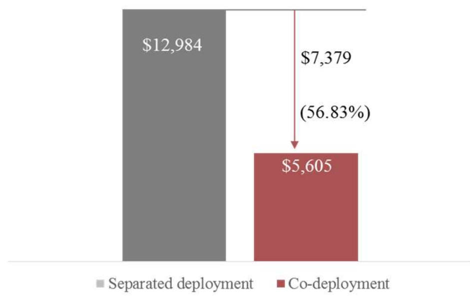
[8] ESCAP, *Co-deployment of fiber optic cables along the highway in Republic of Korea* (Bangkok, 2018). Unpublished report.

[9] ESCAP, *Co-Deployment of Fibre Optic Cables along Transport Infrastructure for SDGs including cross-border* (Bangkok, 2018). Unpublished report

[10] ESCAP, *A Study on Cost-Benefit Analysis of Fibre-Optic Co-Deployment with the Asian Highway Connectivity* (Bangkok, 2018). Available from https://www.unescap.org/sites/default/files/Cost-benefit%20analysis%20of%20fOC%20with%20Asian%20Highway.pdf

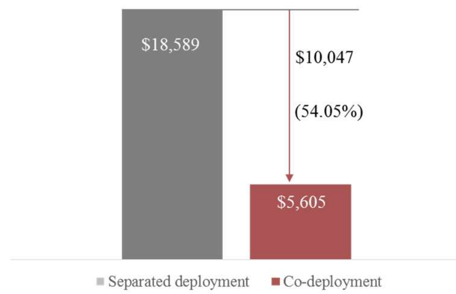
Figure 10: Cost Comparison between Co-deployment and Separate Deployment

Two-way co-deployment vs. separate deployment



Cost saved from co-deployment of ducts (two-way) = USD 7,379 per kilometre
Percentage of cost saving (two-way) = 56.83%

Four-way co-deployment vs. separate deployment



Cost saved from co-deployment of ducts (four-way) = USD 10,047 per kilometre
Percentage of cost saving (four-way) = 54.05%

Source: ESCAP, A Study on Cost-Benefit Analysis of Fibre-Optic Co-Deployment with the Asian Highway Connectivity (Bangkok, 2018)

In addition, co-deployment will help reduce often complex procedures, cost and time of seeking right-of-way (RoW) or permission from multiple entities to deploy FOCs, especially on the existing infrastructure, which could create uncertainty and delay in rolling out planned FOCs. Having FOCs laid during the construction of highways or railways also reduce the risk of damage due to other constructions and farming activities. In the case when concrete ducts are built, these ducts help to clearly demarcate the RoWs and prevent further encroachment. Co-deployment also helps minimize blockage or disturbance to road traffic and other utilities which is normally the situation when deployment of FOCs is done in a separate time period.

Key Issues

This section summarises the key issues highlighted in the information note as follows:

1. **Digital divide remains:** The adoption of fixed broadband access improved in the last decade but remained low at around 3 per cent in 2017 for South and South-West Asia. Most fixed broadband subscriptions is considered unaffordable (monthly expenditure on broadband (fixed) subscriptions is higher than 2 percent of gross national income per capita), except for Maldives and Sri Lanka.

2. **Opportunities for cross-border broadband connectivity**: Limited access to international Internet bandwidth (which often leads to unaffordable broadband access among others) within a country can be addressed through accessing Internet bandwidth from neighbouring countries. Three possible corridors for strengthening cross-border broadband connectivity include the Northern Indian States-Bangladesh-Bhutan corridor; India-Bangladesh-Nepal-Bhutan corridor; and Afghanistan-Pakistan corridor.

3. **Co-deployment of fibre optic cables along passive infrastructure**: Fiber optic cables continue to be the most cost effective and efficient way of transmitting data across borders. Co-deployment of fiber optic cables along passive infrastructure is a cost-effective measure on deploying fiber optic cables, while supporting ITS and providing revenue generating opportunities to the transport sector.

4. **Subregional cooperation**: The Asia-Pacific Information Superhighway (AP-IS) initiative assists countries in the subregion to identify opportunities, challenges and provide policy guidance based on technical studies through regional cooperation.

Subregional cooperation through the Asia-Pacific Information Superhighway initiative

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP[11]) supports a regional cooperation initiative called the Asia-Pacific Information Superhighway (AP-IS)[12] initiative.

The AP-IS initiative focusses on four key areas (pillars): development of ICT infrastructure; efficient Internet traffic and network management; ICT infrastructure resilience from natural disasters (e-resilience); and broadband for all. ESCAP member States have endorsed a Master Plan (2019-2022)[13] and Regional Cooperation Framework Document (2019-2022)[14] to map the common regional/subregional ICT challenges of member countries with current and planned projects/activities/studies of various stakeholders, under the four pillars of the initiative.[15]

The AP-IS initiative implementation takes place in the form of subregional implementation plans. ESCAP collaborates with different sectors (such as transport, energy and business sectors among others) to create synergies. In addition, recognizing that cross-border connectivity challenges between neighbouring ESCAP member States need to be addressed, capacity development workshops geared towards government officials in the ministry responsible for ICT are undertaken. For example, two AP-IS subregional training workshops have been arranged to facilitate lessons learnt from best practices and to commence policy dialogue between countries. As a result, the AP-IS subregion meetings for North and Central Asia[16] and the Pacific[17] were successfully completed in 2018, leading to more informed government officials and meaningful policy dialogue that led to the development of AP-IS subregional plans for implementation in the respective subregions. Trainings for government officials on other areas including e-government and connectivity are supported by ESCAP's Asian and Pacific Training Centre for Information and Communication Technology for Development (APCICT)[18] under the AP-IS initiative.

[11] https://www.unescap.org/
[12] https://www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway
[13] https://www.unescap.org/commission/75/document/E75_INF5E.pdf
[14] https://www.unescap.org/commission/75/document/E75_INF5E.pdf
[15] ESCAP secretariat (in partnership with several stakeholders) has co-hosted the first and second sessions of the AP-IS Steering Committee in 2017 and 2018 respectively. In addition, the ESCAP secretariat hosted the first and second sessions of the Intergovernmental Committee on Information, Communications and Technology, Science, Technology and Innovation (CICTSTI) in 2016 and 2018 respectively. As a result, the AP-IS Master Plan was endorsed by ESCAP member States as a regional cooperation guide to bridging the digital divide.
[16] https://www.unescap.org/events/asia-pacific-information-superhighway-subregional-steering-group-meeting-north-and-central
[17] https://www.unescap.org/events/subregional-workshop-implementation-asia-pacific-information-superhighway-achieving
[18] https://www.unapcict.org/

The AP-IS initiative will support ongoing national initiatives such as Digital India, Digital Bangladesh, and accelerate the transition to challenges and opportunities posed by Industry 4.0, including those related to the transport sector.

Way forward

The corridors identified in this information note highlights an opportunity for close cooperation towards improving ICT connectivity. The following issues could be considered by participants:

- Share information and related documents from the subregional workshop with other relevant government ministries to enhance awareness;
- Strengthen inter-ministerial collaboration between ICT and Transport ministries in the area of ICT infrastructure co-deployment; and
- Conduct pre-feasibility studies on the suggested corridors to assess challenges and opportunities for co-deployment.