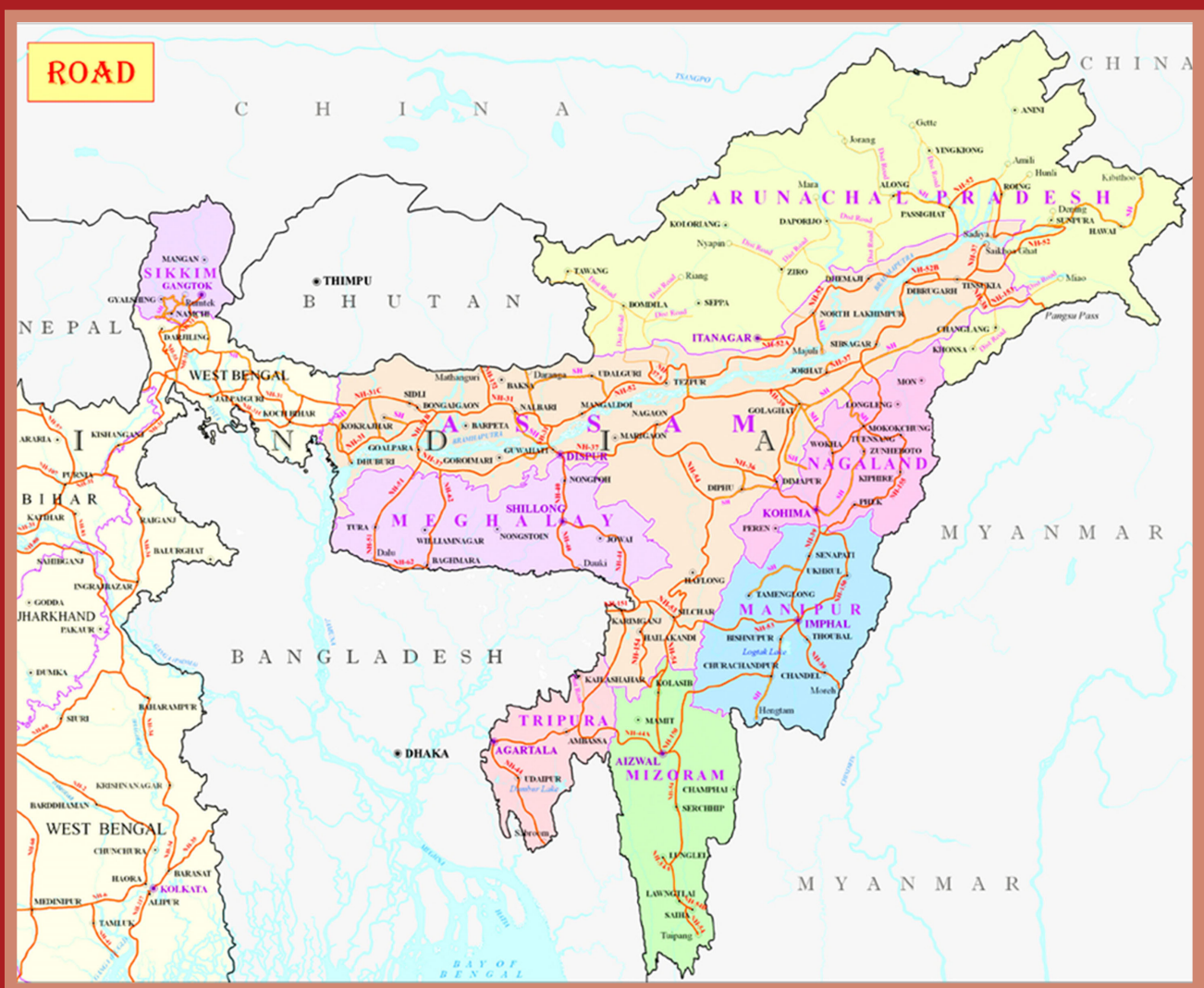


Connecting North Eastern Himalayas

The State of Access, Digital Connectivity, and Inclusion in North Eastern Region of India



Connecting the North Eastern Himalayas: The State of Access, Digital Connectivity, and Digital inclusion in North Eastern Region of India

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1. Problem Statement and Description

The North East Indian States constitute 7.9% of India's geographical area; and as per the last census of 2011, are a 3.8% of the population. The formation of East Bengal and Burma at the time of independence from the United Kingdom is recognised as a rather tangible break in the once better networked economic geography of the region leaving aside the 27-km-wide Siliguri Corridor as the only link to the rest of India. The region was left largely isolated from the development paradigm until the 1990s when economic reforms were introduced. With the advent of telecom technology and innovations there was hope for bridging this gap of distance, connectivity, communication. However, due to calculations of market viability of setting up telecom infrastructure, challenges posed by the geographical terrain, or due to lower population and location, vast sections of the north-eastern region still remain outside of infrastructure and

connectivity considerations, and any significant digital innovative solutions and benefits therein, and by extension is lagging in several development indicators.

1.1 State of Connectivity, Availability & Access

Due to the late initiation into the development paradigm and due to its hilly terrain and frequent natural calamities such as flooding and landslides, there is an infrastructural gap in the North East Region (NER) of India. In the case of internet and mobile connectivity permeation, there are still a sizeable number of villages in the region without mobile connectivity, and low percentage of Gram Panchayats covered by broadband internet.¹

¹ North Eastern Region District SDG Index & Dashboard: Baseline Report 2021-22. Pp- 104. Accessed at: https://www.niti.gov.in/sites/default/files/2021-08/NER_SDG_Index_NITI_26082021.pdf

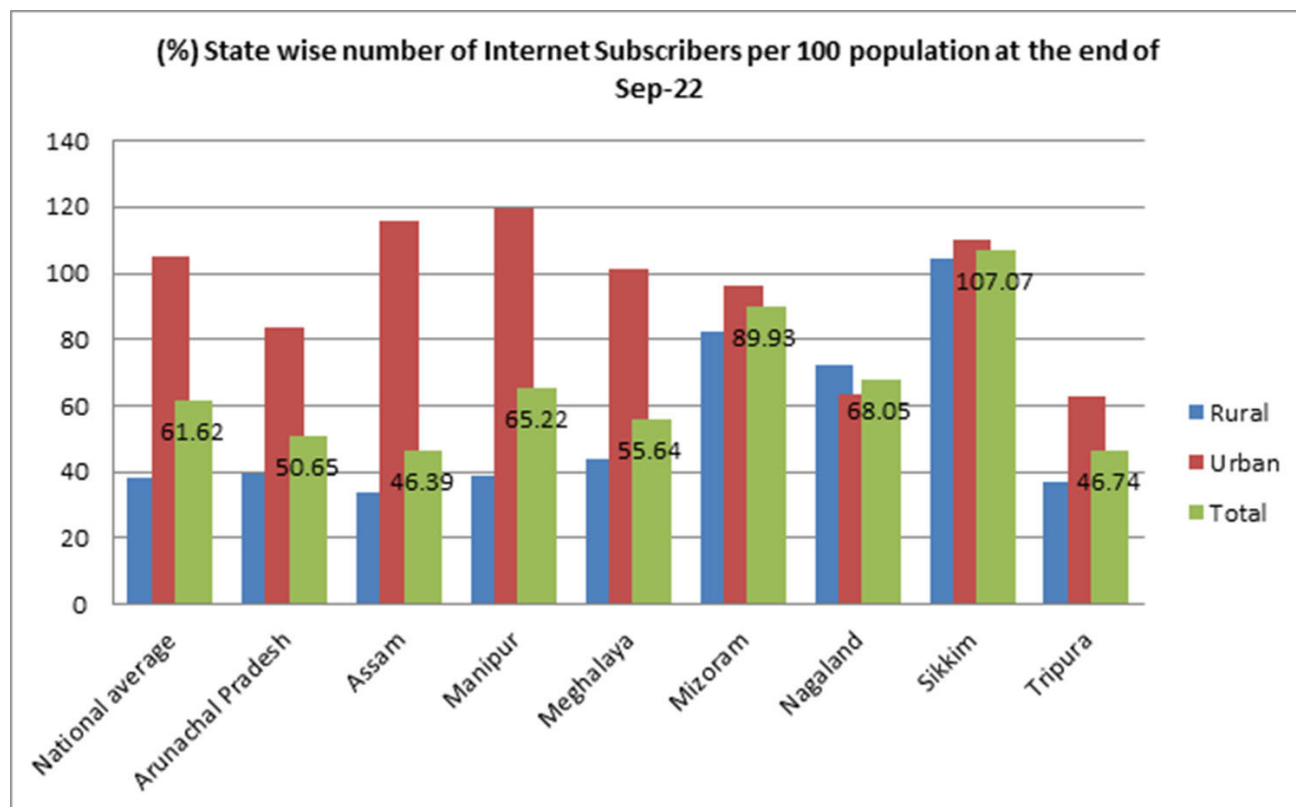
State	Number of villages	Number of mobile uncovered villages	Mobile uncovered villages (in %)
Arunachal Pradesh	4559	2245	49.24
Assam	7388	804	10.88
Manipur	1137	265	23.3
Meghalaya	5623	2040	36.27
Mizoram	771	218	28.27
Nagaland	1535	420	27.36
Sikkim	461	304	65.94
Tripura	639	221	34.58

Source: Ministry of Communications, Department of Communications' reply to unstarred question no. 1310 on 14th December, 2022.

The region also has much scope for better electricity availability and access. Reports of 100% electrification in the region have been found to be incorrect.² Considering the gap in access to network

² <https://www.eastmojo.com/meghalaya/2023/02/04/in-meghalaya-a-garo-village-never-got-power-another-only-got-bills/>

connectivity or first level digital divide in the region, the North-Eastern Region continues to find explicit mention in the ambit of policies to increase connectivity, particularly Comprehensive Telecom Development Plan (CTDP), and Universal Service Obligation Fund (USOF).



Source: TRAI performance indicator report, July-September, 2022

While the state of internet penetration is improving in the region, **the North East Region faces higher network downtime and slower internet speeds.** According to a 2021 study, digital payments transaction failure rates in the region are at 1.5-2X the national average due to 3X higher network downtime and 50% slower internet speeds compared to other regions of the country.³

Data on proportion of active internet users (or users who have accessed the internet at

³ <https://www.rfilc.org/wp-content/uploads/2021/09/Catalyzing-Responsible-Digital-Payments-in-the-North-East-Region-of-India.pdf>

least once in the past month) in the region is unavailable, but the latest National Family Health Survey findings provide a glimpse into the digital divide in the region based on gender and geographical location within rural-urban divide. In Assam, Meghalaya and Tripura less than 40% women have ever used the internet. Assam and Meghalaya are also among the states in the nation with least number of male internet users.⁴ The table below shows indicators for Delhi and Puducherry for comparison.

⁴ <https://www.downtoearth.org.in/blog/science-technology/nfhs-5-how-did-indian-states-fare-in-the-internet-usage-question--74843>

Percentage of individuals to have ever used the internet							Women having a mobile phone they themselves use
	Urban Female	Urban Male	Rural Male	Rural Female	Total Male	Total Female	
Arunachal Pradesh	70	86.9	68.5	49.6	71.6	52.9	76.4
Assam	49	67.4	37.8	24.4	42.3	28.2	57.2
Manipur	50.8	81.5	68.2	40.4	73.9	44.8	72.2
Meghalaya	57.8	59.2	38.5	28	42.1	34.7	67.5
Mizoram	83.8	92.7	63.9	48	79.7	67.6	82.3
Nagaland	66.5	81	55.2	40.3	64.6	49.9	82.5
Sikkim	90	94.2	69.5	68.1	78.2	76.7	88.6
Tripura	36.6	47	45.2	17.7	45.7	22.9	53.1

Source: NFHS-5, 2019-21.

1.2 State of Broadband Reach in North East India

The National Optical Fibre Network (NOFN) is an ambitious initiative to trigger a broadband revolution in rural areas across India. The NOFN was envisaged as an information super-highway through the creation of a robust middle-mile infrastructure for reaching broadband connectivity to Gram Panchayats. It aimed to connect all the 2,50,000 Gram panchayats in the country and provide 100 Mbps connectivity to all gram panchayats (GPs). To achieve this, the existing fibres of PSUs (BSNL, Railtel and Power Grid) were utilised and incremental fibre was laid to connect to Gram Panchayats wherever necessary. Dark fibre network thus created was lit by appropriate technology thus creating sufficient bandwidth at the Gram Panchayats.

Non-discriminatory access to the NOFN was provided to all the service providers like Telecom Service Providers (TSPs), ISPs, Cable TV operators and Content providers to launch various services in rural areas. The NOFN project was funded by the Universal Service Obligation Fund (USOF).

Based on NOFN experiences, newer, updated and upgraded version - BharatNet was conceived as a nation-wide broadband network. BharatNet as a project of national importance was to establish a highly scalable network infrastructure accessible on a non-discriminatory basis, to provide on demand, affordable broadband connectivity of 2 Mbps to 20 Mbps for all households and on demand capacity to all institutions, to realise the vision of Digital India, in partnership with States and the private sector. The entire project as being funded by Universal service Obligation Fund (USOF) was set up for improving telecom services in rural and remote areas of the country. The objective has been to facilitate the delivery of e-governance, e-health, e-education, e-banking, Internet and other services to the rural India.

The project as a Centre-State collaborative project, with the States contributing free Rights of Way for establishing the Optical Fibre Network is undergoing three-phase implementation. The first phase envisaged providing one lakh gram panchayats with broadband connectivity by laying underground optic fibre cable (OFC) lines by December 2017. The second phase aimed to provide connectivity to all 2,50,500-gram

panchayats in the country using an optimal mix of underground fiber, fiber over power lines, radio and satellite media. It was to be completed by March 2019.

In the third phase from 2019 to 2023, state-of-the-art, future-proof network, including fiber between districts and blocks, with ring topology to provide redundancy is to be created. The scope of BharatNet has now been extended to reach all villages in the country in accordance with the announcement made by the Prime Minister on 15th August 2020. On 30.06.2021, Government accorded approval for a revised strategy for implementation of BharatNet through Public-Private Partnership (PPP) model in 16 States of the country covering about 3.61 lakh villages (including 1.37 lakh GPs).

As on 27th June, 2022, the status of implementation of BharatNet is as under: -

- Total 1,81,216 GPs (1,68,010 GPs on OFC and 4,351 GPs on satellite) have been made Service Ready in the country.
- Wi-Fi hotspots have been installed in 1,04,288 GPs
- 2,13,834 Fibre to the Home broadband connections are provided
- 36,333 km Dark Fibre is leased and
- 4,038 Gbps bandwidth has been leased using BharatNet network



Status of NOFN and BharatNet in North East as in 2022

ARUNACHAL PRADESH	
Number of Districts	4
Number of Blocks	43
Number of GPs	447
Executive Agency	RAILTEL
ASSAM	
Number of Districts	19
Number of Blocks	91
Number of GPs	1013
Executive Agency	BSNL
MANIPUR	
Number of Districts	4
Number of Blocks	13
Number of GPs	310
Executive Agency	RAILTEL
MEGHALAYA	
Number of Districts	5
Number of Blocks	28
Number of GPs	589
Executive Agency	RAILTEL
MIZORAM	
Number of Districts	8
Number of Blocks	20
Number of GPs	290
Executive Agency	RAILTEL

TRIPURA	
Number of Districts	8
Number of Blocks	44
Number of GPs	618
Executive Agency	RAILTEL
NAGALAND	
Number of Districts	2
Number of Blocks	12
Number of GPs	246
Executive Agency	RAILTEL

The above highlights signal a slow progress and process in implementing broadband reach in the region due to technical, topographical and logistical challenges. Another aspect will be the speed and resilience of the connectivity to actually provide access to real time internet and speed to navigate the digital world and services in the remote of the remote locations / blocks / districts across the region.

1.3 State of ICT / Digital Connectivity and Access in Education

The Unified District Information System for Education Plus (UDISE+) report released by Ministry of School Education and Literacy provides information about availability of computer facility and internet in schools among other indicators. The table below reports information on the availability of functional computers and internet connectivity for schools in the region. For comparison, data from Gujarat and Maharashtra has been added.

State	Total schools	Internet facility	Schools with internet in percentage	Schools with functional computers	Schools with functional computers in percentage
Arunachal Pradesh	3603	794	22.037	1161	32.223
Assam	60859	7126	11.709	9900	16.267
Manipur	4617	1065	23.066	1659	35.932
Meghalaya	14600	2460	16.849	2599	17.801
Mizoram	3911	307	7.849	2033	51.981
Nagaland	2718	1383	50.883	1467	53.973
Sikkim	1259	434	34.471	747	59.332
Tripura	4929	896	18.178	1169	23.716
Gujarat	53851	49522	91.961	52664	97.795
Maharashtra	109605	52553	47.947	86163	78.612

(Source: UDISE+ Report 2021-22)

Information on availability of computer was divided further based on whether the computers were functional. It has been pointed out that the actual level of computer education in the schools may be lower due to factors such as apportioning lesser importance to computer education in comparison to finishing school syllabus, lack of teachers' capacity to train students, etc.⁵

Access to functional computers and internet connectivity is of paramount importance in school education in an era where computer literacy is increasingly becoming compulsory for every citizen. Add to this the value of digital literacy in job market and the many avenues it opens up for one to build their career. Yet, the north east Indian states continue to lag behind in these two infrastructural markers not only in comparison to the more developed regions of the nation, but many states also lag behind in comparison to the national average. To be able to harness the economic opportunities made possible due to

a rise of digital adoption and of improving the quality of employment available to the people of the region, it is imperative that quality access to internet and ICT is facilitated at nominal costs.

1.4 State of Tele-density

Lowest tele-density in North East India

Lowest tele-density reflects the number of telephone connections per 100 individuals and it reflects the penetration of telecom services among the population of an area

- Assam has the lowest tele-density in the Northeast, followed by Meghalaya and Nagaland.
- Assam's tele-density stood at 71.75 (wireline plus wireless) per 100 persons of which 71.29 is wireless as on June 2021.
- The overall tele-density figure for Meghalaya stood at 75.06 of which 74.22 was wireless

⁵ <https://itforchange.net/computer-graveyards-and-museums>

and that of Nagaland 75.46 (wireline+ wireless) and 74.95 (wireless).

- There has been increase in the overall tele-density of these three states in 2022, compared to June 2018 when the overall figures stood at 63.52 for Assam, 73.12 for Meghalaya and 65.38 for Nagaland.
- Sikkim had the highest tele-density in the region at 142.49 (wireless plus wireline) of which 141.7 was wireless, followed by Mizoram at 117.58 (overall) and 116.05 (wireless), Arunachal Pradesh 89.66 (overall) and 88.55 (wireless), Tripura (overall 78.93) and 78.16 (wireless) and Manipur 77.22 (overall) and 76.45 (wireless).
- Like Assam, Nagaland, Meghalaya, the overall tele-density Sikkim and Mizoram tele-density have also increased since June 2018.
- However, there has been a fall in the overall wireless and wireline tele-density of Arunachal Pradesh (100.43), Manipur (81.36) and Tripura (82.98) compared to June 2018.

[The official tele-density data as tabled in the Lok Sabha in February 2022]

That the telecom infrastructure in the region has been growing but tele-density could take a hit for multiple reasons. These could be because of the rise in tariff, more use of WiFi and Covid-induced lockdown.

1.5 Speed, Access & Meaningful Connectivity

The rising focus on *meaningful connectivity* globally is due to the recognition that internet users have vastly different outcomes from going online if they are disabled, elderly, illiterate,

rural, having limited bandwidth, speak only a vernacular language or use alternative platforms like mobile phones. The Alliance for Affordable Internet (A4AI) defines meaningful connectivity as “when we can use the internet every day using an appropriate device with enough data and a fast connection.” A4AI has been a global coalition dedicated towards making internet access more affordable to people around the world and has members from across the private sector, public sector, academia, civil society and foundations. The coalition proposes that internet connectivity measurement indicators should take account of the quality of internet access and should capture the differential capacities between users. The coalition proposes data collection across the components of download speeds, device type, sufficient data, and frequency of connection.

- **Download speeds:** In India, for close to 10 years, the minimum download speed requirement to qualify as broadband network was set at 512 Kb/s. This was changed in February 2023 to the minimum download speed requirement of 2 Mb/s (approx. 2,000 Kb/s). The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) categorises broadband speeds in 4 groups of low broadband speed (< 5 Mb/s); lower-middle broadband speed (6-49 Mb/s); upper-middle broadband speed (50-99 Mb/s); and high broadband speed (> =100 Mb/s). The rationale is that broadband speeds lower than 20 Mb/s may cause connectivity issues such as buffering and difficulty connecting multiple devices, speeds of 100 Mb/s or higher are considered capable of handling multiple online activities and users without interruptions.
- As per December 2022 data, the mean wireless internet speed in India was 108.86 Mb/s but the median download

speed was 25.29 Mb/s. This represents the fact that in India, traditionally telecom infrastructure presence has varied widely across metropolitan, urban, semi-urban, and rural regions due to market profitability considerations.⁶ **According to the January 2023 records, with the exception of Assam (22.55 Mb/s), urban centres of Every North Eastern State recorded median wireless download speeds below the recommended 20 Mb/s.**⁷

However, it must be noted that the speedtest captures the median speeds across localities in the cities of the 8 northeastern states and a comprehensive aggregation inclusive of the towns and villages of the states may drive the median download speed available in the region to much lower than captured in current data.

- **Device type:** Ideally, one should have an option to access internet through a range of devices such as laptop, tablet, smartphone, etc. At the most basic level, websites (including government websites) are built to perform better on desktop when compared to the mobile version. Inadequate screen space, badly spaced buttons, and lack of full keyboard on a device can be a barrier to accessing features and services more fully for many people. However, many households in this region continue to share a single device. Further, 97% of internet users in the region were reported to be wireless prepaid connection users and mobile phone is the most common device of access.⁸

- **Sufficient data:** Access to unlimited broadband connection at home or place of education or work allows us to make fuller use of the internet to improve our list of alternatives and skills. Basic data package of connectivity is set at 1.5 gigabytes per month at a minimum download speed of 3 Mb/s, and those unable to afford the same are categorized as *internet poor*.⁹ While segregated numbers of the data usage in the region is unavailable, the monthly average wireless data usage per wireless data subscriber in the nation has risen to 17.18 GB.¹⁰
- **Frequency of connection:** Daily access of internet increases the likelihood of gaining real benefits from technology as the means to information and empowerment. Currently there is no available data on active internet users and frequency of access from the region.

1.6 Affordability: The cost of access relative to income and the level of competition in the Internet marketplace.

The UN Broadband Commission defines affordability of broadband internet as entry level data priced at less than 2% of average monthly income. To achieve this, income has to increase and broadband prices should fall. India has one of the lowest mobile data prices across the world but this is accompanied by a high incidence of poverty. A comparison of per capita income in the region reveals a wide range of per capita income in the region with Sikkim ranking as the second most prosperous state, and in the other extreme 6 or the 8 states fall below the national average.

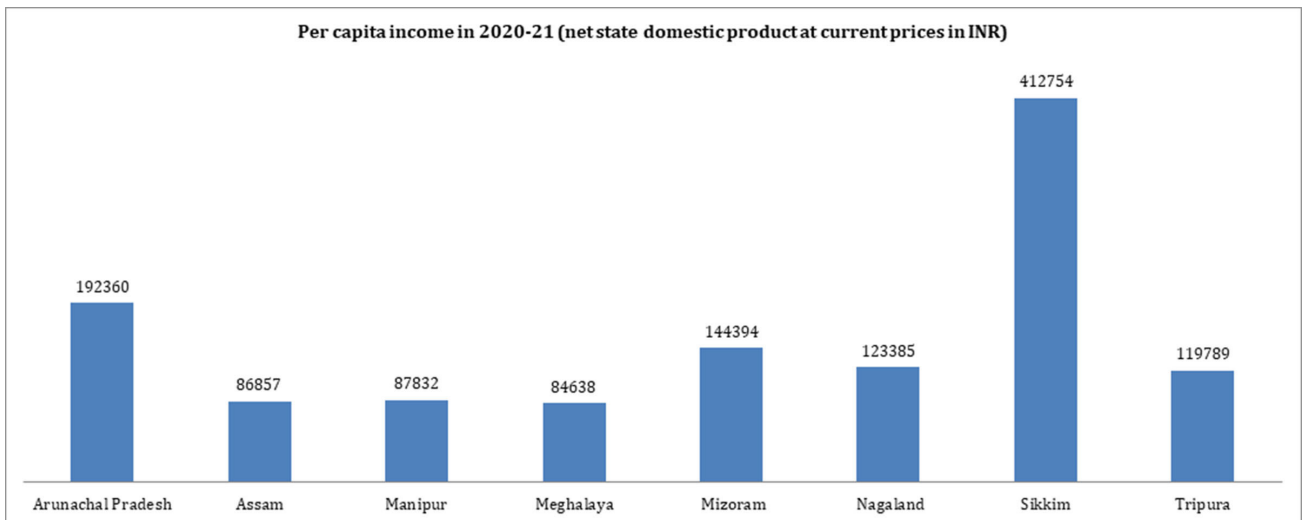
⁶<https://www.thehindu.com/news/national/new-broadband-definition-highlights-the-plight-of-indias-barely-connected-grey-spots/article66500639.ece>

⁷ Speedtest by Ookla. Accessed at: <https://www.speedtest.net/>

⁸ TRAI performance indicator report July – September, 2022; released on February, 2023.

⁹<https://www.brookings.edu/blog/future-development/2021/07/26/measuring-internet-poverty/>

¹⁰ Source: TRAI performance indicator report, July-September, 2022.



(Source: Handbook of Statistics on Indian States 2021-22, Reserve Bank of India)

There are essentially four service providers that operate in the region- Reliance JIO Infocomm Limited, Bharti Airtel Limited, Bharat Sanchar Nigam Ltd., and Vodafone-Idea Ltd. The lowest possible cost of accessing internet per month is around INR 200.¹¹ By UN Broadband Commission's definition of affordability of internet data plans, the average user in Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura in the region spends more than 2% of their monthly income to access entry level plans. The average price of a smartphone is now around INR 22,000 where it was INR 15,000 rupees two years ago, negatively impacting digital access and use.¹²

1.7 Relevance: The existence and extent of local language content and relevant content.

Ideally, people should be able to avail e-Health services, e-Finance services, and e-Education services adapted to their language and geography to make choices on further course of action but permeation of these services beyond the urban centres is negligible. The scale of language diversity in the region has been one of the challenges fulfilling the criteria of relevant content in this region. At the national level AI has

often been proposed as a possible means of making linguistically diverse content available to some of the larger Indic language groups.¹³

The Census 2011 data on languages of India was released in 2018. At the time of the survey, speakers of 121 languages were enumerated where 22 languages serve as scheduled languages, and 99 non-scheduled languages (including English).¹⁴ Languages with less than 10,000 speakers were not enumerated.¹⁵ Of the 99 non-scheduled languages, 63 non-scheduled languages have a sizeable population of speakers in the northeastern states. It was revealed that the northeastern states compose the most linguistically diverse region in the country with Nagaland and Arunachal Pradesh being most diverse. The diversity in languages in these two states has meant that "Nagamese" and Hindi is used for market transactions in these states, respectively.¹⁶ The official languages of the states leave much scope for inclusion of more languages for better accessibility of information and preservation of linguistic diversity.¹⁷

¹³<https://analyticsindiamag.com/india-bets-big-on-ai-for-low-resource-language/>

¹⁴ <https://www.theindiaforum.in/article/what-census-obscures>

¹⁵ Mapping India's Language and Mother Tongue Diversity and its Exclusion in the Indian Census.

¹⁶<https://morungexpress.com/nagamese-official-language-nagaland-serious-issue>

¹⁷<https://www.dailypioneer.com/2021/columnists/preserving-the-linguistic-diversity-of-northeast-india.html>

¹¹<https://indianexpress.com/article/technology/best-prepaid-plans-with-unlimited-calling-data-from-airtel-vodafone-idea-and-jio-under-rs-200-8406158/>

¹² <https://www.bbc.com/news/world-asia-india-64293857>

State	Official language(s)
Arunachal Pradesh	English
Assam	Assamese, Bengali (in Barak Valley Districts), Bodo (in Bodo Territorial Council area) & English
Manipur	Meiteilon
Meghalaya	Khasi,
Mizoram	Mizo, English
Nagaland	English
Sikkim	English, Nepali, Sikkimese (Bhutia) and Lepcha
Tripura	Bengali and Kokborok

In the digital sphere, there is some use of language transliterated in the Roman script (even for languages with their own script) primarily for interactions on social media, and for news and information content in the region. Consumption of video content is also seeing a rise in the region via YouTube channels, social media forwards and short videos. Entertainment platforms like *reeldrama.com* and *MovieSaints* have hosted localized entertainment and educational content on northeast, primarily in Assamese language.

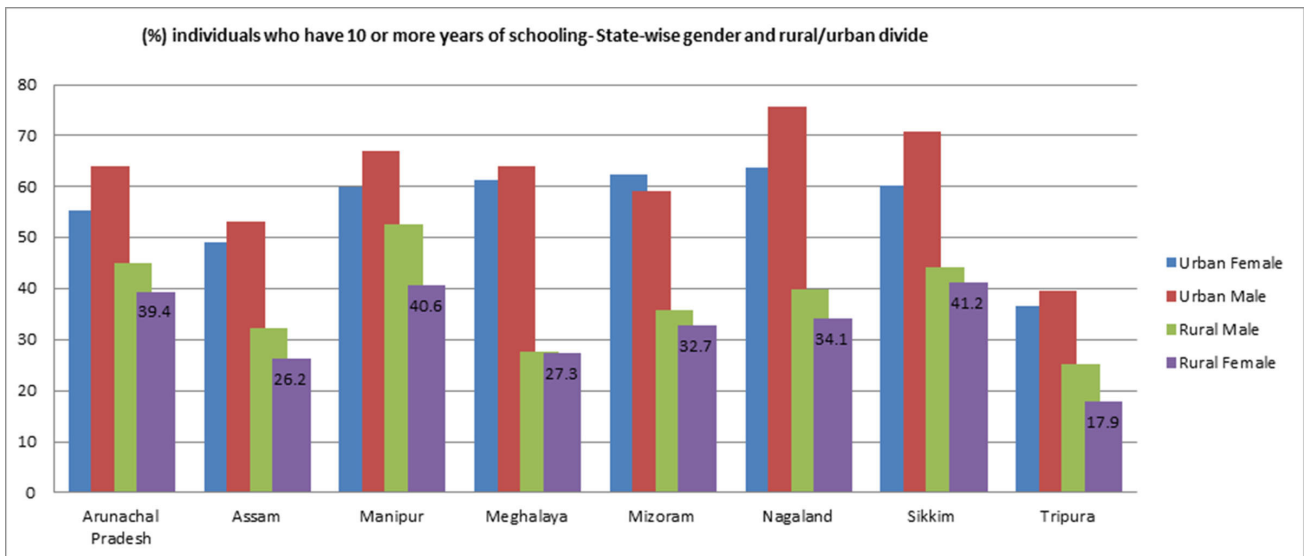
While there is a paucity of studies factoring in issues posed by language and internet usage in this region, a 2017 study based on 8 Indian languages (Hindi, Bengali, Telugu, Marathi, Tamil, Gujarati, Kannada, and Malayalam) found that availability of local language content made meaningful usage of internet more widely accessible to the people.¹⁸ The study

¹⁸ Indian Languages- Defining India's Internet: A study by KPMG in India and Google. Accessed at: <https://assets.kpmg.com/content/dam/kpmg/in/pdf/2017/04/Indian-languages-Defining-Indias-Internet.pdf>

reported that accessing digital classifieds, online government services, and accessing e-tailing websites/applications are some areas where the internet users in the 8 languages surveyed expected more use of their preferred language. This study also reported that while use of local languages in digital banking is preferable, the primary issue faced by them in accessing online banking services is posed by limitations of their device and by extension, a need for better adapted applications and websites for smartphones.

1.8 Readiness: The capacity to access the Internet, including skills, cultural acceptance, and supporting policy.

Readiness in the context of accessing the internet is positively affected by higher literacy rate and level of education, trust and safety in navigating the internet, and policies supporting the bridging of digital divide across gender and geographic location.



(Source: NFHS- 5, 2019-21)

Currently there is no information available on the level of trust and safety the people of the region accord to their experience on the internet.

When it comes to policies supporting the bridging of digital divide across gender and geographic location, skills are imparted through 3 government schemes – National Digital Literacy Mission (NDLM), Digital Saksharta Abhiyan (DISHA), and ‘Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA). The government regularly updates data on the number of individuals who

enrolled, were trained, and who were certified.¹⁹ While there is presence of programmes focused on skilling girls and women in STEM, and in digital literacy undertaken by non-governmental organizations (NGO), foundations, and private sector there is an opportunity for the government to catalyse gender-based skilling programmes in the region. Several states in the region witness low digital participation from women, and in rural areas.

¹⁹ <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1885365>

2. Potential mechanisms or areas of focus for intervention

2.1. Policies and Interventions that can accelerate – Government leads the way

- **Universal Service Obligation Fund (USOF):** The Universal Service Obligation Fund was constituted in 2002. Over the years, its goal has evolved to support the cost of providing affordable access to ICT and telecom services to underserved areas of the country. The funds are raised through 'Universal Access Levy', contributed by licensed telecom operators at the rate of 5% of their adjusted gross revenue. The USO fund is utilized to support the cost of telecom infrastructure development in North Eastern region, among a few other regions, through the scheme of Comprehensive Telecom Development Plan (CTDP for NER), and to implement BharatNet project.
- **Telecom Technology Development Fund (TTDF) Scheme:** The scheme was launched on October 1st, 2022. This funding scheme is constituted under the USOF. The primary goal of this funding scheme is to support indigenous innovation in technology design and development aligning with the goal of providing affordable access to broadband and mobile services in rural and remote areas. An expected outcome of this scheme is to create an ecosystem for research and design aimed at meeting domestic needs in telecommunication innovation and access.
- **BharatNet Project:** Previously known as National Optical Fibre Network (NOFN), the purpose of the BharatNet project was

to establish fiber cable networks upto every Gram Panchayat (GP) in the country. However, due to high cost of establishing optical fibre cable networks and their operation and maintenance in remote and less populous locations, it was decided that some locations will be provided satellite connectivity under BharatNet project. The configuration of satellites currently in use (GSAT-11 and GSAT-19) for the BharatNet project provides slower internet access. BharatNet project has been implemented in two phases nationwide. In phase-I, GPs in the states of Assam, Manipur, Meghalaya, Nagaland and Tripura were provided connectivity. In phase-II another round of GPs in Arunachal Pradesh, Assam, Mizoram, Nagaland, and Tripura were provided broadband access.

- **Comprehensive Telecom Development Plan for North-Eastern Region (CTDP for NER):** The comprehensive development for the north-eastern region was approved in 2014 to be funded from the USOF. This was done to support telecom operators to provide network coverage in the region. For years, telecom service providers have refrained from extending operations in the region due to market profitability considerations. However, the project had struggled to find bidders in the initial tenders despite government funding.²⁰
- In the recent Economic Survey 2022-23, it was reiterated that under CTDP for NER,

²⁰ <https://morungexpress.com/no-takers-ne-telecom-development-plan-0>

mobile connectivity on 2G is to be provided in the uncovered villages and along National Highways of Assam, Manipur, Mizoram, Nagaland, Tripura, Sikkim, and Arunachal Pradesh (National Highways only) by the state-run Bharat Sanchar Nigam Limited (BSNL); and several 4G connectivity projects are to be undertaken by the private telecom companies.

- Currently there are two 4G coverage projects funded by USOF active in the region- a project to install 1094 towers is in uncovered villages Meghalaya; a project to provide 4G services to villages in Arunachal Pradesh and two districts of Assam (Karbi Anglong and Dima Hasao).
- In 2021 an agreement was signed for the hiring of 10 Gigabits per second (Gb/s) international bandwidth from Bangladesh Submarine Cable Company Limited (BSCCL), Bangladesh for connectivity via the state of Tripura. Since then, two 10 Gb/s links have been commissioned.
- **PM WANI Scheme:** Prime Minister's Wi-Fi Access Interface or PM-WANI as a scheme was launched in December 2020. It aims to set up public Wi-Fi networks in the manner of public call offices (PCO) years prior. Access points known as Public Data Office (PDO) will operate and maintain Wi-Fi access points providing broadband access to users in the price range of INR 2- 20. One of the goal of this scheme is to help the service providers, usually village-level entrepreneurs or businessmen, generate income from providing Wi-Fi access.

2.2. Alternative technologies for improving digital connectivity and access specific to terrains and geography

- **Community Networks:** Community networks are defined as “networks which “deliver access to underserved areas with infrastructure built, managed and used by local communities, oftentimes in areas that are financially unattractive for mainstream internet service providers.” Community networks help increase adoptability of internet connection once connection with the national internet backbone is established. The national internet backbone can be either of the satellite connectivity, telecom towers, or fibre optical cable networks. In India, AirJaldi in Dharamshala, Gram Marg in Mumbai and Digital Empowerment Foundation are a few organisations aiding the establishment of community networks.
- At present the category of satellites used to provide internet connectivity are geostationary satellites. These technologies provide significantly slower connection than other options such as fibre optical cable, towers, etc. The emerging technologies of Low Earth Orbital satellites and Middle Earth Orbital satellites are yet to be incorporated in India.
- Free Space Optics Technology (FSOC) is a technology which uses light for the transmission of information through “free space” like air or vacuum. FSOC technology is currently in the stage of pilot testing in Nagaland where Kohima Science College is being provided connectivity via Kohima Secretariat, Nagaland.

3. Digital connectivity for addressing climate change and energy sustainability in North East India

Digital connectivity can play a significant role in addressing climate change and advancing sustainable energy practices in the region with environment and climate fragility. By leveraging digital connectivity, the region can improve energy efficiency, promote renewable energy integration, reduce greenhouse gas emissions, and enhance climate resilience. It is essential to invest in robust digital infrastructure, promote digital literacy, and foster collaboration between stakeholders to maximize the potential of digital connectivity for climate and energy initiatives.

Smart Grids: Digital connectivity can enable implementation of smart grids, which utilize advanced sensors, communication networks, and data analytics to optimize energy distribution and consumption in all States of the region with power volatility and demand exceeding supply and enough seismic challenges due to

hydropower generations. Smart grids will enable integration of renewable energy sources, efficient load management, and real-time monitoring, leading to reduced greenhouse gas emissions and improved energy efficiency.

Digital Connectivity and Renewable Energy

The future of renewable energy can be poised for radical shift in North Eastern Region of India. Governments, governing organisations, and the corporate sector can come forward to generously providing funding and incentives. The renewable energy potential in North Eastern Region (NER) from different sources is estimated to be 1,28,962 MW. As against this, 4,834.58 MW renewable capacity has been installed in NER. The details are given in Table-1 and Table-2 below: -

Table-1: Renewable energy capacity installed in North Eastern Region

S. No.	STATES / UTs	Small Hydro Power	Bio-Energy	Solar Power	Large Hydro Power	Total installed Capacity
		(MW)	(MW)	(MW)	(MW)	(MW)
1	Arunachal Pradesh	131.11	0	11.23	1115.00	1257.34
2	Assam	34.11	2.00	112.93	350.00	499.34
3	Manipur	5.45	0	12.25	105.00	122.70
4	Meghalaya	32.53	13.80	4.15	322.00	372.48
5	Mizoram	36.47	0	7.88	60.00	104.35
6	Nagaland	30.67	0	3.04	75.00	108.71
7	Sikkim	52.11	0	4.65	2282.00	2338.76
8	Tripura	16.01	0	14.89	0	30.90
	Total (MW)	338.46	15.80	171.02	4309.00	4834.58

Table 2: Estimated potential of Renewable Energy in the North Eastern Region

S. No.	STATES / UTs	Wind Power	Small Hydro Power	Bio-Energy	Solar Power	Large Hydro Power	Total
		(MW)	(MW)		(MW)	(MW)	(MW)
1	Arunachal Pradesh	274	2064.92	8	8650	50064	61060.92
2	Assam	246	201.99	220	13760	650	15077.99
3	Manipur	0	99.95	15	10630	1761	12505.95
4	Meghalaya	1	230.05	13	5860	2298	8402.05
5	Mizoram	0	168.9	3	9090	2131	11392.9
6	Nagaland	0	182.18	10	7290	1452	8934.18
7	Sikkim	0	266.64	2	4940	4248	9456.64
8	Tripura	0	46.86	5	2080	0	2131.86
	Total (MW)	521	3261.49	276	62300	62604	128962.49

Source: Rajya Sabha (April 2022) as published in <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1814441>

But the push for digital connectivity is a significant project that is expected to revolutionise the sector in the region going forward. High-speed internet has a lot of advantages. Energy suppliers, for instance, may set up infrastructure that is more effective, dependable, and sustainable and adjust to shifting environmental factors like wind speed and sunlight. By adding intuitive sensors and automation to improve forecasting and preventive maintenance, they can decrease downtime. Such systems can control the flow of electricity and monitor usage on the customer's

end, resulting in time- and demand-based power supply. Additionally, it would make charging schedules easier, aid in energy storage, and reduce waste. The most recent technological advancements are significantly accelerating the movement towards decarbonization, from cutting-edge connectivity solutions provided by private wireless, such as 4.9G/LTE and 5G, to AI/ML, the Internet of Things (IoT), cloud computing, robotics, augmented and virtual reality, and big data analytics.

4. Digital Connectivity and Health

Digital connectivity has played a significant role in transforming the healthcare landscape in India. It has enabled the growth of telemedicine services, allowing patients to consult with healthcare providers remotely, particularly beneficial in improving access to healthcare for individuals in rural and underserved areas. It has facilitated the dissemination of health information and awareness campaigns in India. Several digital health platforms have emerged in India, providing a range of services to individuals that offers features such as online doctor consultations, appointment scheduling, health record management, medicine delivery, and health tracking. The Indian government has been actively promoting digital connectivity in healthcare through initiatives like the National Digital Health Mission (NDHM). NDHM aims to create a unified digital health ecosystem in the country, including the implementation of Electronic Health Records (EHRs). With the increasing availability and affordability of wearable devices and fitness trackers, digital connectivity has enabled individuals in India to monitor their health more effectively. It has improved public health surveillance capabilities in India.

Despite these advancements, the existing challenges in India's digital health ecosystem has been largely evident. Issues like internet

connectivity disparities, language barriers, and the digital divide among different socioeconomic groups can limit access to digital health services. Addressing these challenges and ensuring equitable access to digital connectivity and healthcare resources remains a priority for the Indian government and healthcare stakeholders.

ABHA Number

The issuance of The ABHA (Ayushman Bharat Health Account) Number is a no less significant instance of how digital connectivity is also propelling health information systems and services till the last mile. Access and delivery of ABHA reflects standardization of the process of identification of an individual across healthcare providers to ensure that the created medical records are issued to the correct individual or accessed by Health Information User through appropriate consent. While the ABHA (Ayushman Bharat Health Account) Number is being used for the purposes of uniquely identifying persons, authenticating them, and threading their health records (only with the informed consent of the patient) across multiple systems and stakeholders, the state of ABHAs created in North Eastern States are as below, which are lesser than leading states of the country:

State/UT	Ayushman Bharat Health Account
Assam	15475514
Manipur	523663
Tripura	493001
Nagaland	480240
Mizoram	358615
Sikkim	325261
Meghalaya	298840
Arunachal Pradesh	221737

A strong digital connectivity and infrastructure facility also reflects how health facilities are managed, governed and navigated through the public and private health services providers. As

compared to key leading States and regions of the country, the North Eastern Region (NER) has to take further more robust steps.

State/UT	Verified Health Facilities
Assam	6136
Meghalaya	698
Mizoram	493
Arunachal Pradesh	270
Sikkim	198
Tripura	118
Nagaland	92
Manipur	25

Overall, digital connectivity has the potential to transform healthcare in India by improving access to healthcare services, enhancing health awareness, supporting remote consultations, and empowering individuals to take control of

their health. There is wider scope to develop the backbone necessary to support the integrated digital health infrastructure of the country. It will bridge the existing gap amongst different stakeholders of healthcare ecosystem through digital highways.



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