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Bridging the Urban-Rural Digital Divide in Pakistan:

Strategies and Policies for inclusive ICT Access

CENTRE for AEROSPACE & SECURITY STUDIES, LAHORE

BRIDGING THE URBAN-RURAL DIGITAL DIVIDE IN PAKISTAN: STRATEGIES AND POLICIES FOR INCLUSIVE ICT ACCESS

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ABSTRACT

The intricate interplay between urban and rural digital disparities in Pakistan constitutes a critical concern that significantly intersects with the nation's broader socio-economic trajectory. Drawing upon empirical evidence, transnational perspectives, and a nuanced exploration of Pakistan's evolving digital landscape, this study underlines the urgent need for democratised access to Information and Communication Technology (ICT) as a cornerstone for comprehensive national development. A thorough analysis of the underlying factors disseminating this digital divide reveals many challenges, from inadequate infrastructure to socio-cultural barriers. This paper presents a diverse range of evidence-based strategies and policy frameworks meticulously crafted to bridge the digital gap. Central to our discourse is the advocacy for a synergistic approach that harmonises top-down policy imperatives with grassroots innovations. By aligning with global benchmarks, these proposed interventions seek to rectify existing disparities and catalyse transformative shifts in digital literacy, infrastructure resilience, and inclusive ICT governance. This paper outlines actionable pathways toward realising Pakistan's Digital Pakistan vision, grounded in principles of inclusivity, equity, and sustainable socio-economic progress.

Keywords: Urban-Rural Digital Dichotomy, Democratised ICT Accessibility, Socio-Cultural Barriers, Digital Literacy, Infrastructure Resilience, Inclusive Governance, Global Benchmarks

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1. INTRODUCTION

Information and Communication Technologies (ICTs) are pivotal in catalysing socio-economic development, yet disparities in access, particularly in developing nations such as Pakistan, undermine these benefits. The digital divide between urban and rural areas in Pakistan is a significant issue. While 35 percent of the country's population has access to the internet, primarily in urban areas, rural regions, which are home to 64 percent of the population, face challenges such as connectivity issues, literacy deficits, and economic and educational barriers.[1]

Commendably, within a decade, Pakistan's IT services contribution to total ICT exports surged from 44 to 73 percent, growing annually by 17.3 percent. However, Pakistan's global ICT services share remains a paltry 0.2 percent as of 2018.[2] The nation's ICT Development Index (IDI) ranking has deteriorated to 135, reflecting a lag behind other South Asian economies.[3]

This digital chasm not only impedes Pakistan's commitment to equitable and widespread ICT access but mirrors a worldwide challenge potentially exacerbating existing disparities. Attaining Target 9.c of the Sustainable Development Goals (SDGs) for universal digital inclusivity by 2030 is imperative to harnessing the digital era's benefits.

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[1] Naveed Haq, "Dera Brings the Internet to Farmers in Pakistan, Narrowing the Rural-Urban Divide," Internet Society, November 9, 2021, https://www.internetsociety.org/blog/2021/11/dera-brings-the-internet-to-farmers-in-pakistan-narrowing-the-rural-urban-divide/.

[2] State Bank of Pakistan, "The State of Pakistan's Economy. First Quarterly Report of 2019-20," www.sbp.org.pk, 2020, https://www.sbp.org.pk/reports/quarterly/fy20/First/qtr-index-eng.html.

[3] International Telecommunication Union (ITU), "The ICT Development Index," ITU, 2022, https://www.itu.int/en/ITU-D/Statistics/Pages/IDI/default.aspx.

This paper stresses ICTs' transformative potential in education, healthcare, and financial services, stressing the urgency of bridging Pakistan's urban-rural digital divide. All-inclusive access to ICTs across all Pakistani communities is essential. The analysis herein investigates into the digital divide's root causes and complications and advocates for targeted strategies and policy interventions to address this divide.

1.1. BACKGROUND

Since the liberalisation of the telecom sector in 2003, Pakistan has experienced significant economic and social growth, largely due to the adoption of ICTs. When information technology began gaining prominence in the 1970s, discussions revolved around the impact of this technology, particularly the "information gaps" between developed and developing countries. This awareness eventually led to the coining of a new term in the 1990s - the 'digital divide.' This term encompasses a broader meaning than just an information gap. According to the Organisation for Economic Co-operation and Development, the digital divide is defined as "the gap between individuals, households, businesses, and geographic areas at different socio-economic levels concerning their access to information and communication technologies (ICT) and their use of the internet."[4] However, the digital divide exists on various other levels, including sectors, communities, and individuals.

1.1.1. Global Perspectives, and Strategies

Bridging digital divides is a critical challenge for sustainable and inclusive development in today’s world. Therefore, it is important to understand the global

[4] OECD, “UNDERSTANDING the DIGITAL DIVIDE,” 2001, https://www.oecd.org/sti/1888451.pdf.

perspectives on bridging digital divides and learn from the successful strategies, and best practises of different countries and contexts.

Bridging digital divides stands as a pivotal challenge for sustainable and inclusive development globally. Understanding global perspectives and successful strategies from different countries is crucial. A 2021 study identified four key dimensions of digital divides: access, skills, usage, and outcomes. These dimensions, influenced by socioeconomic, cultural, and political factors, are interrelated and dynamic, varying across groups and regions.

Successful strategies in various countries include:

- Providing universal and affordable broadband internet and mobile network access, exemplified by Rwanda's national fibre-optic backbone and 4G expansion.[5]
- Enhancing digital literacy and skills development, such as India's Pradhan Mantri Gramin Digital Saksharta Abhiyan scheme.[6]
- Promoting digital inclusion through public-private partnerships, illustrated by Kenya's M-Pesa mobile money platform and iHub innovation hub.[7]
- Ensuring digital rights and governance, as seen in Estonia's digital society principles.[8]

Moreover, digitalisation's impact on gender equality, income, and employment is a significant area of research. For instance, mobile phone technology in rural Uganda

[5] World Bank, “PPIAF | RWANDA: Optimization of the KTRN National Fiber Backbone and 4G Network,” www.ppiaf.org, June 21, 2021, https://www.ppiaf.org/activity/rwanda-optimization-ktrn-national-fiber-backbone-and-4g-network-0.

[6] PMGDISHA, “Pradhan Mantri Gramin Digital Saksharta Abhiyan,” www.pmgdisha.in, 2023, https://www.pmgdisha.in/.

[7] Øyvind Økland, “Nairobi’s lHub: Technology for Society,” *Springer EBooks*, January 1, 2019, 189–209, https://doi.org/10.1007/978-3-030-10653-9_10.

[8] e-Estonia, “Story,” e-Estonia, 2002, https://e-estonia.com/story/.

improves household income and gender equality.[9] Research emphasises ICT literacy to narrow gender inequality in low- and middle-income countries, showcasing how digital access and knowledge can reduce gender disparities and enhance women's economic status.[10]

2. CURRENT LANDSCAPE

Pakistan has made significant progress towards the development of its ICT sector through the implementation of various policies and initiatives. The "Digital Pakistan Policy" and "Digital Pakistan Vision" aim to improve connectivity, advance digital infrastructure, and foster innovation and technological entrepreneurship.[11] The government's commitment to establishing a robust ICT infrastructure has led to rapid growth in the telecom and ICT sectors, with over 197 million telecom subscribers (fixed and mobile) as of FY 2022.[12] The digital economy's contribution to the GDP is projected to increase, with the ICT core industry and digital and IT sectors expected to contribute significantly to the GDP by 2025.[13] With a continuously improving ICT infrastructure, Pakistan is positioning itself as a digital economy with great potential for mobile-based digital payments and other financial services to the unbanked.[14]

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[9]Hina Amber and Bezawit Beyene Chichaibelu, “Narrowing the Gender Digital Divide in Pakistan: Mobile Phone Ownership and Female Labor Force Participation,” *Review of Development Economics*, April 17, 2023, https://doi.org/10.1111/rode.12994.

[10]Lia Puspitasari and Kenichi Ishii, “Digital Divides and Mobile Internet in Indonesia: Impact of Smartphones,” *Telematics and Informatics* 33, no. 2 (May 2016): 472–83, https://doi.org/10.1016/j.tele.2015.11.001.

[11]Ministry of IT and Telecom, “Digital Pakistan Policy Ministry of IT & Telecom R Digital Pakistan Policy,” 2018, https://moib.gov.pk/Downloads/Policy/DIGITAL_PAKISTAN_POLICY%2822-05-2018%29.pdf.

[12]Pakistan Telecommunication Authority, “Annual Reports | PTA,” pta.gov.pk, 2022, https://pta.gov.pk/en/data-&-research/publications/annual-reports.

[13]Tahir Amin, “Contribution of Digital, IT Sectors to GDP Estimated at 13pc by 2025,” Brecorder, September 14, 2022, https://www.brecorder.com/news/40197381.

[14]Pakistan Telecommunication Authority, “Annual Reports | PTA,” pta.gov.pk, 2022, https://pta.gov.pk/en/data-&-research/publications/annual-reports.

According to the latest statistics from the World Bank, there has been a notable increase in the number of mobile cellular subscriptions per 100 inhabitants in several countries including Pakistan, Bangladesh, India, and low-income countries. The figure 1 below covers the period from 1990 to 2022, providing a comprehensive and detailed overview of the trends and patterns of mobile cellular usage in these regions.[15] The key observations are:

1. **Bangladesh**: The number of mobile subscriptions per 100 people has increased significantly from 0.02 in 1997 to 105.26 in 2022. This indicates the rapid growth and adoption of mobile technology in Bangladesh.
2. **India**: Similar to Bangladesh, India has also seen a significant increase in mobile subscriptions per 100 people, from 0.08 in 1997 to 80.65 in 2022.
3. **Pakistan**: Pakistan has seen a significant increase in mobile subscriptions per 100 people, from 0.10 in 1997 to 81.75 in 2022.

This indicates a global trend of increasing mobile cellular subscriptions, reflecting the growing accessibility and usage of mobile technology. However, it's important to note that while the number of subscriptions has increased, this doesn't necessarily mean that every individual has access to a mobile device, as some people may own multiple subscriptions.

[15]World Bank, "Mobile Cellular Subscriptions," World Bank Open Data, 2022, https://data.worldbank.org/indicator/IT.CEL.SETS.P2?end=2022&locations=PK-XN-IN-BD&name_desc=true&start=1990&view=chart.

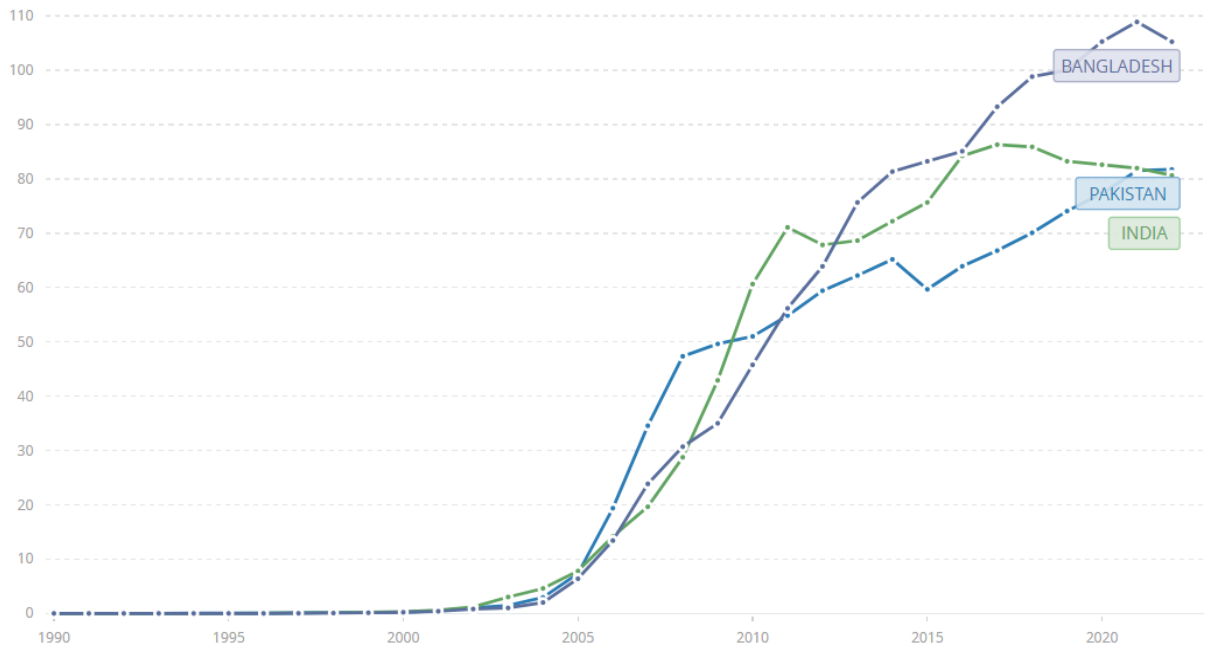


FIGURE 1: Mobile Cellular Subscriptions (per 100 people)[16]

Source: World Bank (2022)

3. ASSESSING PAKISTAN'S POSITION IN THE E-GOVERNMENT DEVELOPMENT INDEX (EGDI)

The United Nations E-Government Development Index (EGDI) evaluates national e-government development using a compositae index derived from three normalised indices: Telecommunications Infrastructure Index (TII), Human Capital Index (HCI), and Online Service Index (OSI). This study examines Pakistan's EGDI score, which falls below the global average, revealing disparities in e-government development and the enduring digital gap. The focus is on identifying the specific factors influencing Pakistan's EGDI score.

[16]World Bank, "Mobile Cellular Subscriptions," World Bank Open Data, 2022, https://data.worldbank.org/indicator/IT.CEL.SETS.P2?end=2022&locations=PK-XN-IN-BD&name_desc=true&start=1990&view=chart.

In the 2020 UN E-Government Survey Report, Pakistan was ranked 153rd out of 193 countries, placing it within the "middle EGDI" category.[17] Pakistan exhibits comparatively low fixed broadband penetration and a low number of active Internet users, positioning it among the least connected nations globally. Despite this, Pakistan is classified as "high" in the sub-index of Online Service Index, a notable achievement considering its limited infrastructure development.

3.1. Comparative Analysis

The EGDI serves to evaluate the rural-urban digital gap's influence on e-government progress. A higher EGDI score signifies greater e-government preparedness and efficacy, while a lower score indicates the opposite. Pakistan markedly improved its EGDI ranking, reaching the 150th position in 2022, with its E-Government and Online Services Index rising to 0.42 and 0.57, respectively, signalling digital governance and service enhancements. Moreover, Pakistan's Human Capital Index rose to 0.39, underscoring a focus on human resource development. Bangladesh ascended to the 111th rank, while India slightly dropped to the 105th position, showcasing sustained digital transformation efforts.

Comparatively, Pakistan exhibits a lower EGDI score than Bangladesh and India in 2020 and 2022, implying less developed e-government compared to its neighbours. This discrepancy is largely due to Pakistan's low TII score, indicating inadequate ICT infrastructure, particularly in rural regions. This deficiency impacts OSI and HCI scores, compromising online public service availability and quality. Furthermore, limited internet

[17]United Nations, “UN E-Government Survey 2020,” Un.org, 2020, https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020.

access hinders e-learning and ICT skill development, constraining human capital growth and digital transformation potential. Hence, Pakistan's rural-urban digital gap notably contributes to its low EGDI score. Bridging this disparity demands increased investment in rural ICT infrastructure, bolstering e-government readiness, performance, and socio-economic progress.

E-Government Development Index							
Survey Year	**Country Name**	**E-Government Rank**	**E-Government Index**	**E-Participation Index**	**Online Service Index**	**Human Capital Index**	**Telecommunication Infrastructure Index**
2022	**Pakistan**	150	0.4238	0.3636	0.5658	0.3933	0.3122
	Bangladesh	111	0.563	0.5227	0.6521	0.59	0.4469
	India	105	0.5883	0.5909	0.7934	0.5761	0.3954
2020	**Pakistan**	153	0.4183	0.5238	0.6294	0.3818	0.2437
	Bangladesh	119	0.5189	0.5714	0.6118	0.5731	0.3717
	India	100	0.5964	0.8571	0.8529	0.5848	0.3515

TABLE 1: Country- wise E-Government Development Index[18]

Source: Calculated from UN Survey Report

3.2. Components of EGDI

3.2.1. Online Service Index (OSI)

The OSI evaluates the availability and quality of online government services. In Pakistan, basic services such as tax filing and utility bill payments are accessible through digital platforms. Enhancing user interfaces, expanding service offerings, and ensuring seamless user experiences are essential steps toward bolstering Pakistan's OSI score.

[18]UN Survey Report, “Data Center,” Un.org, 2020, https://publicadministration.un.org/egovkb/Data-Center.

3.2.1.1. Analysis of Comparing Pakistan's OSI Scores with Global Averages for Online Services Index

The graph compares the OSI scores of Pakistan, Estonia, Republic of Korea, and India in 2022. It reflects how well online public services are provided by national governments. Estonia has the highest OSI score of 1.0, followed by Republic of Korea with 0.98, India with 0.79, and Pakistan with 0.57. The world, region, and sub-region averages are around 0.7, 0.8, and 0.7 respectively. Pakistan's OSI score is below all three averages, showing that it needs to improve its online service availability and quality.

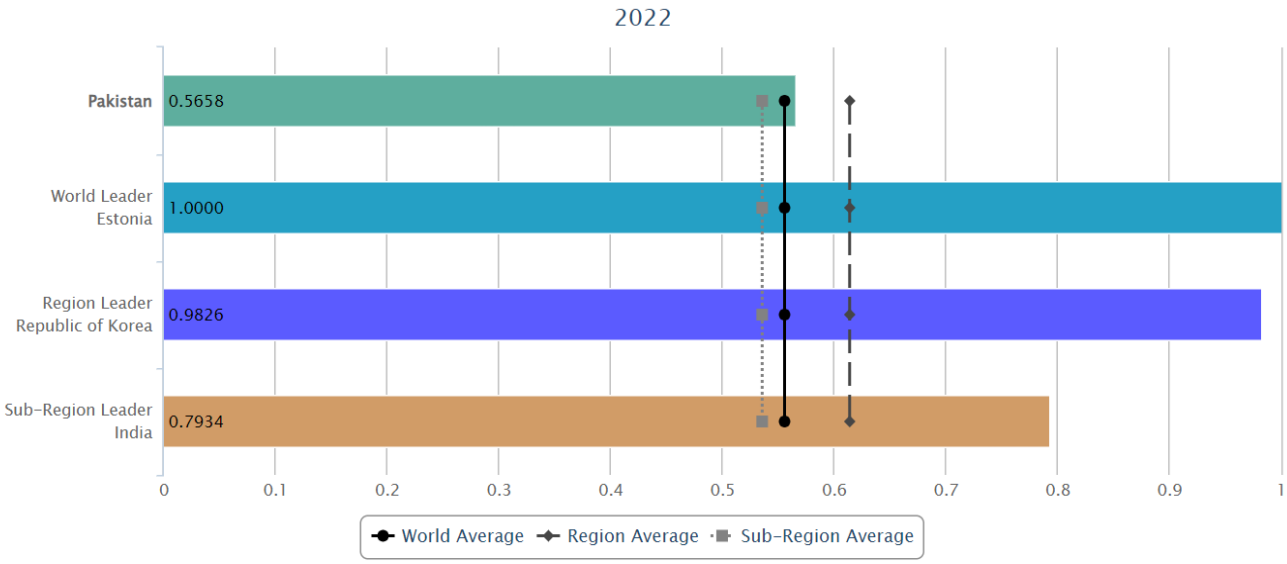


FIGURE 2: Online Service Index

Source: UN E-Government Survey 2022[19]

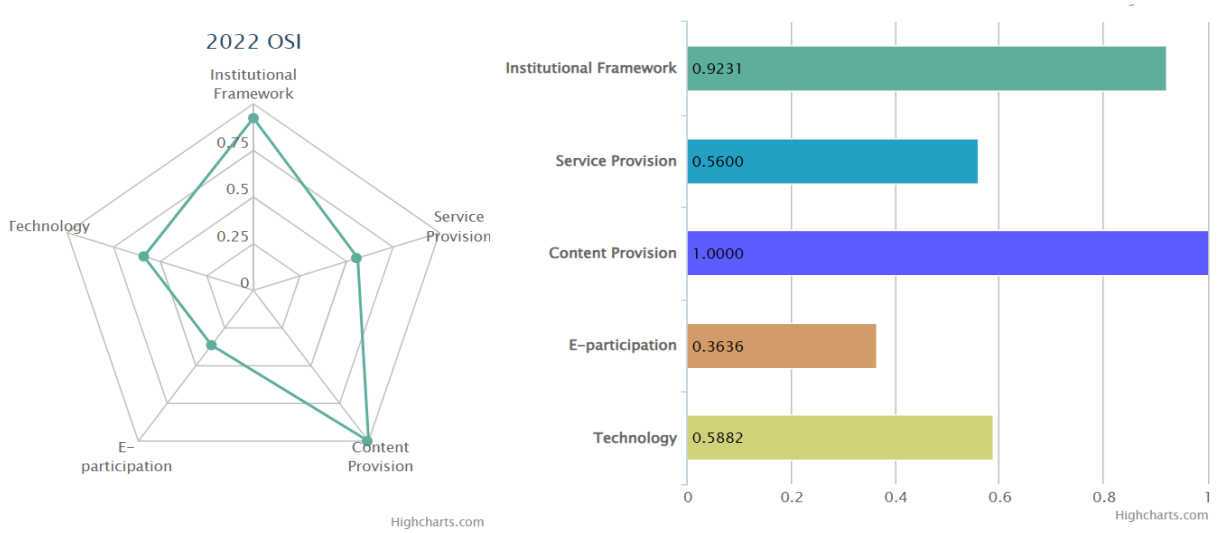
3.2.1.2. Analysis of Pakistan's OSI Performance Across Categories

The 2022 OSI radar depicts Pakistan's performance across categories such as Institutional Framework, Service Provision, Content Provision, E-participation, and

[19]UN, "E-Government Development Index," Un.org, 2022, https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index.

Technology. Pakistan has excelled in Institutional Framework and Content Provision, scoring 0.92 and 1.00 respectively. However, E-participation lags with a score of 0.36, indicating a need for enhanced citisen engagement. Moderately scored in Service Provision (0.56) and Technology (0.59) implies room for improvement in diverse online services and ICT infrastructure/security.

The yearly analysis reveals Pakistan's OSI fluctuations from 2003 to 2022, peaking at 0.63 in 2020 and slightly declining to 0.57 in 2022. This suggests inconsistent e-government development, pointing to potential challenges or barriers hindering Pakistan's full potential.



Online Service Index	2022	2020	2018	2016	2014	2012	2010	2008	2005	2004	2003
Pakistan (Value)	0.56580	0.62940	0.54860	0.32609	0.32283	0.36601	0.24761	0.42474	0.42692	0.47490	0.29694

FIGURE 3: Pakistan Yearly Online Service Index (OSI)

Source: UN E-Government Survey 2022[20]

[20]UN, "E-Government Development Index," Un.org, 2022, https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index.

3.2.2. Human Capital Index (HCI)

Human-Computer Index (HCI) evaluates citisens' effectiveness in engaging with e-government services. Pakistan grapples with challenges in digital literacy and skills development. Essential initiatives focusing on digital education, training, and awareness are imperative. Through strategic investment in human capital, Pakistan can enable its citizens to adeptly navigate e-government platforms. Areas specifying the specific reasons for Pakistan low ranking in the HCI are:

- **Education:** Pakistan's government education spending is 2.9 percent of its GDP, lower than the regional (3.8 percent) and income group (4.5 percent) averages.[21,22] 75 percent of 10-year-olds cannot read a simple text, higher than regional (59 percent) and income group (59 percent) averages. Additionally, only 37 percent of secondary-school age children are enrolled in secondary school. [23]
- **Health:** Pakistan spends 0.9 percent of its GDP in public spending on health. This is lower than both the regional average (2.0 percent) and the average for its income group (2.8 percent).[24] The probability of dying between ages 30 and 70 from cardiovascular disease, cancer, diabetes, or chronic respiratory diseases is 25 percent. This is higher than both the average for its region (22 percent) and the average for its income group (21 percent).

[21]World Bank, "Human Capital Project - Pakistan," 2020, https://databankfiles.worldbank.org/public/ddpext_download/hci/HCI_2pager_PAK.pdf.
[22]World Bank, "Human Capital Project - Pakistan," 2020, https://databankfiles.worldbank.org/public/ddpext_download/hci/HCI_2pager_PAK.pdf.
[23]World Bank, "Human Capital Project - Pakistan," 2020, https://databankfiles.worldbank.org/public/ddpext_download/hci/HCI_2pager_PAK.pdf.
[24]World Bank, "Human Capital Project - Pakistan," 2020, https://databankfiles.worldbank.org/public/ddpext_download/hci/HCI_2pager_PAK.pdf.

- **Social Assistance:** Pakistan spends 0.6 percent of its GDP on social assistance.[25] This is lower than both the regional average (1.1 percent) and the average for its income group (1.4 percent). Only 21 percent of the poorest quintile is covered by social safety nets.

3.2.2.1. Analysis of Comparing Pakistan's HCI Values Globally

The Human Capital Index (HCI) value of Pakistan in 2022 is 0.39, which is lower than the South Asia average of 0.48 and more comparable to Sub-Saharan Africa's average HCI value of 0.40.[26] The data indicates that Pakistan is lagging behind not only globally but also compared to regional and sub-regional leaders. Australia, with a perfect score of 1.00, is the world leader, whereas Pakistan is significantly below the Region Leader, Republic of Korea, at 0.91, and Sub-Region Leader, Iran at 0.78.[27]

[25]World Bank, "Human Capital Project - Pakistan," 2020, https://databankfiles.worldbank.org/public/ddpext_download/hci/HCI_2pager_PAK.pdf.

[26]Tahir Amin, "Human Capital Index: Pakistan's Value Lower than South Asia's Average: World Bank," Brecorder, May 3, 2023, https://www.brecorder.com/news/40240051.

[27]Tahir Amin, "Human Capital Index: Pakistan's Value Lower than South Asia's Average: World Bank," Brecorder, May 3, 2023, https://www.brecorder.com/news/40240051.

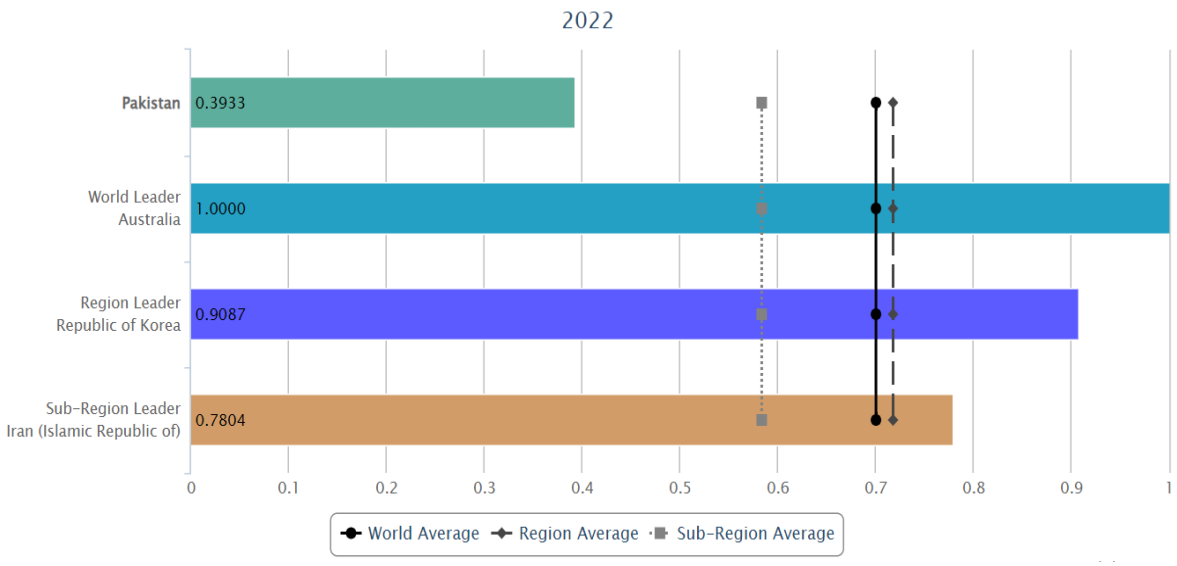


FIGURE 4: Human Capital Index (HCI)

Source: UN E-Government Survey 2022[28]

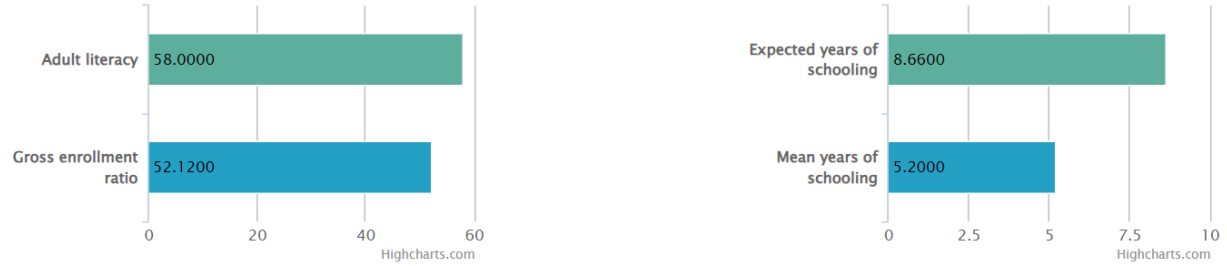
3.2.2.2. Yearly Analysis of Pakistan's HCI

The data presented indicates notable advancements in Pakistan's human capital development, as demonstrated by a steady increase in the HCI. Nevertheless, there remains ample scope for enhancing the education sector, as evidenced by the literacy rate and the number of years of schooling.

- **Adult Literacy**: The chart indicates that the adult literacy rate in Pakistan stands at 58 percent. This represents the proportion of adults who possess basic reading and writing skills.
- **Gross Enrolment Ratio**: The gross enrolment ratio is 52 percent. This statistic is used in the education sector to determine the number of students enrolled in school at different grade levels.

[28]UN, "E-Government Development Index," Un.org, 2022, https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index.

- **Expected Years of Schooling**: The expected years of schooling in Pakistan is 8.66 years. It provides an estimate of the number of years of schooling a child can expect to receive.
- **Mean Years of Schooling**: Similarly, the mean years of schooling is shown as 5.20 years. This is the average number of completed years of education of a country's population.



Human Capital Index	2022	2020	2018	2016	2014	2012	2010	2008	2005	2004	2003
Pakistan (Value)	0.39330	0.38180	0.36820	0.31898	0.33370	0.35717	0.50256	0.46586	0.40000	0.41000	0.42000

FIGURE 5: Pakistan Yearly Human Capital Index (HCI)

Source: UN E-Government Survey 2022[29]

3.2.3. Telecommunication Infrastructure Index (TII)

Pakistan's Telecommunication Infrastructure Index (TII) shows progress in mobile and internet connectivity, yet persistent disparities exist, especially in rural areas. Challenges in building a robust telecommunications infrastructure stem from financial constraints, geographic obstacles, and a lack of technical expertise. TII is adversely affected by limited rural technology access, marked by device scarcity and inadequate

[29]UN, "E-Government Development Index," Un.org, 2022, https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index.

broadband and mobile networks. Additionally, a notable digital literacy deficit impedes effective infrastructure utilisation. To enhance TII, critical steps involve substantial government and private sector ICT investments in infrastructure, digital education, and related services. Furthermore, infrastructure growth depends on favourable ICT policies addressing digital rights, data protection, and cybersecurity. Pakistan's TII ranking in 2022 was 0.31, below global, regional, and sub-regional averages. While Pakistan lags behind, leading nations demonstrate potential for infrastructure growth, indicating significant room for improvement.

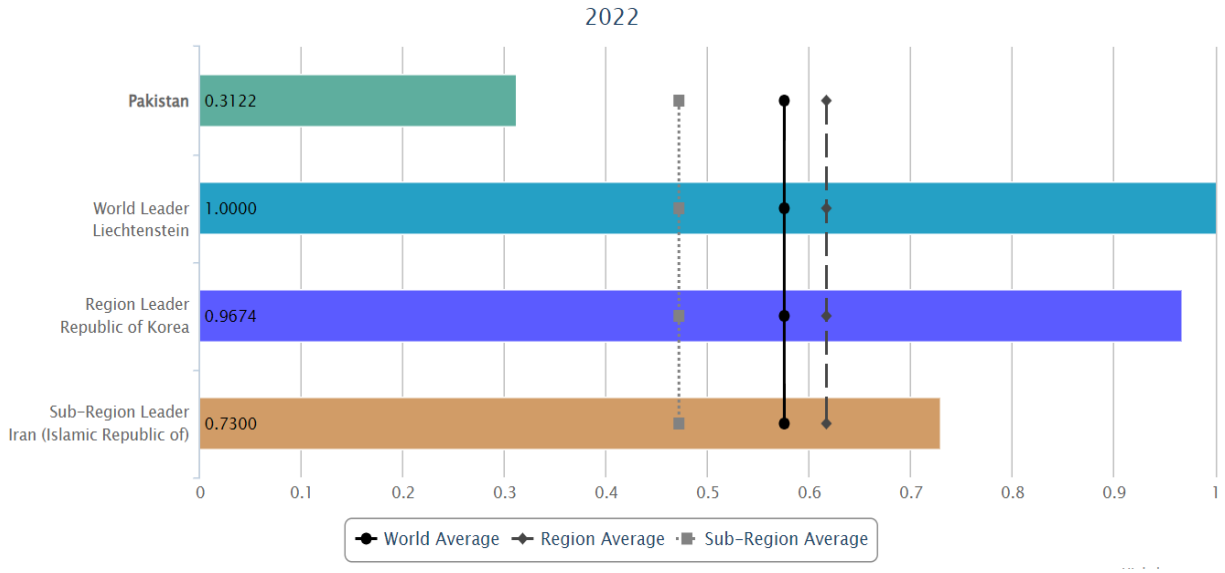


FIGURE 6: Telecommunication Infrastructure Index (TII)

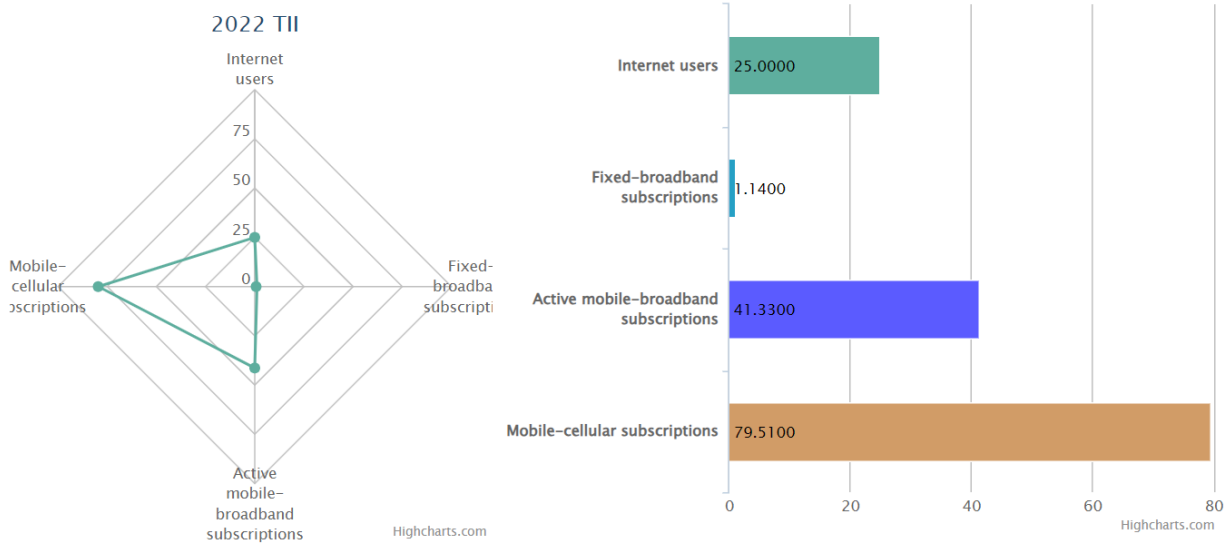
Source: UN E-Government Survey 2022[30]

3.2.3.1. Yearly Analysis of Pakistan's TII

The chart displays four main metrics – Internet users, fixed-broadband subscriptions, active mobile-broadband subscriptions, and mobile-cellular subscriptions.

[30]UN, "E-Government Development Index," Un.org, 2022, https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index.

Among these, mobile-cellular subscriptions show the highest value, while fixed-broadband subscriptions have the lowest. This gives a detailed view of Pakistan's TII in 2022, highlighting strengths in mobile-cellular subscriptions and pinpointing areas for enhancement in fixed-broadband subscriptions. Furthermore, the historical TII values from 2003 to 2022 included in the table offer a valuable chronological perspective.



Telecommunication Infrastructure Index	2022	2020	2018	2016	2014	2012	2010	2008	2005	2004	2003
Pakistan (Value)	0.31220	0.24370	0.15290	0.12989	0.11743	0.12385	0.07709	0.05396	0.02383	0.02765	0.02555

FIGURE 7: Pakistan Yearly Telecommunication Infrastructure Index (TII)

Source: UN E-Government Survey 2022[31]

4. GEOGRAPHIC AND DEMOGRAPHIC DISPARITIES

In Pakistan, internet accessibility disparity disproportionately affects rural areas, hindering economic progress and marginalising communities. The 2022 Digital report reveals that Pakistan has 97.2 million internet users, equating to a 43 percent penetration

[31]UN, "E-Government Development Index," Un.org, 2022, https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index.

rate, lower than the global (63 percent) and South Asian (50 percent) averages.[32] Geographic disparities in internet access and use exist within Pakistan, between urban and rural areas, and among provinces and regions. Key statistics highlighting these disparities are as follows:

- **Urban-rural internet access divide:** 62 percent urban vs. 25 percent rural.[33]
- **Varying internet penetration rates across provinces:** 68 percent in Islamabad to 9 percent in Balochistan.
- **Significant gender gap:** Only 22 percent of internet users and 18 percent of mobile phone owners are female.[34]
- **Low digital literacy and education levels:** 60 percent literacy, 34 percent with primary education, poor education quality, and limited access to computers and the internet in educational institutions.[35]
- Poor broadband speed (10.1 Mbps compared to the global average of 54.3 Mbps), dominated telecom sector, limited rural network investment, and inadequate government funding for ICT infrastructure.[36]
- Rural population (64 percent) has limited internet access, while urban areas (72 percent) have higher access. Some rural areas lack internet due to security concerns, impacting local rights and opportunities. Initiatives like the Dera Ismail

[32] "Digital 2022: Pakistan." DataReportal, 2022. https://datareportal.com/reports/digital-2022-pakistan.

[33] "Digital 2022: Pakistan."DataReportal, 2022. https://datareportal.com/reports/digital-2022-pakistan.

[34] "Digital 2022: Pakistan."DataReportal, 2022. https://datareportal.com/reports/digital-2022-pakistan.

[35] Simon Kemp, “Digital in Pakistan: All the Statistics You Need in 2021,”DataReportal – Global Digital Insights, February 11, 2021, https://datareportal.com/reports/digital-2021-pakistan.

[36] UCA News Reporter, “Pakistan’s Digital Divide ‘Causing More Inequality’ - UCA News,” ucanews.com, April 20, 2020, https://www.ucanews.com/news/pakistans-digital-divide-causing-more-inequality/87614.

Khan project aim to bridge the rural-urban digital gap by providing internet access to farmers via a solar-powered community network.[37]

4.1. Barriers to Inclusivity in Bridging the Urban-Rural Digital Divide

In Pakistan, several barriers contribute to the urban-rural digital gap, including:

- **Infrastructure**: Despite a teledensity rate of 90 percent and a high number of telecom and broadband subscribers, rural areas lack adequate telecom infrastructure.[38]
- **Affordability**: High costs of ICT devices and services pose challenges for low-income groups, with mobile data costs exceeding recommended affordability thresholds, reducing rural demand for digital services.[39]
- **Literacy and skills**: Rural areas exhibit lower literacy and digital skills, hindering participation in the digital economy, as indicated by Pakistan's Social and Living Standards Measurement Survey 2018-19.[40]

[37] Naveed Haq, “Dera Brings the Internet to Farmers in Pakistan, Narrowing the Rural-Urban Divide,” Internet Society, November 9, 2021, https://www.internetsociety.org/blog/2021/11/dera-brings-the-internet-to-farmers-in-pakistan-narrowing-the-rural-urban-divide/.

[38] Lester Henry, “‘Bridging the Urban-Rural Digital Divide and Mobilizing Technology for Poverty Eradication: Challenges and Gaps,’” 2019, https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2019/03/Henry-Bridging-the-Digital-Divide-2019.pdf.

[39] Alliance for Affordable Internet (A4AI), “AFFORDABILITY REPORT 2020 ACKNOWLEDGEMENTS,” 2020, https://a4ai.org/wp-content/uploads/2020/12/Affordability-Report-2020.pdf.

[40] Government of Pakistan, Pakistan Bureau of Statistics, "Pakistan Social and Living Standards Measurement (PSLM) 2018-19 Report: National and Provincial,"

- **Content and language**: Limited access to digital services, particularly in local languages, restricts rural users' access to information, education, and e-government, reducing the value of ICTs.[41]
- **Gender and social norms**: Women and girls face obstacles in ICT access due to gender norms, affordability, digital literacy, safety, and relevance, resulting in a significant gender gap in mobile ownership and internet use, particularly pronounced in rural areas. Measures recommended by DRF include increasing digital literacy, enhancing safety, and promoting relevant content to ensure women's digital inclusion in Pakistan.[42]

4.2. Teledensity: Bridging the Digital Divide in Pakistan

Teledensity, a vital telecom development indicator in Pakistan, which measures the number of telephones per hundred residents. With an impressive 90 percent teledensity, Pakistan has over 197 million telecom subscribers and 124 million broadband subscribers, reflecting a penetration rate of 56 percent and an average usage of 6.8 GB per subscriber per month.[43] The 2019-20 Pakistan Social and Living Standards Measurement (PSLM) survey highlighted a digital divide, revealing that only 12 percent of households own computers, laptops, or tablets, with a notable urban-rural disparity.[44] In rural areas, ownership stands at 7 percent, while urban areas show a higher 19 percent.

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[41] Lester Henry, "'Bridging the Urban-Rural Digital Divide and Mobilizing Technology for Poverty Eradication: Challenges and Gaps,'" 2019, https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2019/03/Henry-Bridging-the-Digital-Divide-2019.pdf.

[42] "Annual Report 2022," Digital Rights Foundation, 2022, https://digitalrightsfoundation.pk/wp-content/uploads/2023/05/Annual-Report-2022.pdf.

[43] "Pakistan Telecommunication Authority. *Annual Report 2022.*" (Islamabad: Pakistan Telecommunication Authority, 2023), https://www.pta.gov.pk/assets/media/pta_annual_report_2022_10012023.pdf.

[44] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

However, 93 percent of households own a mobile phone or smart device. Internet availability is reported by 33 percent of households, with urban areas showing 48 percent compared to 23 percent in rural areas. The figure below showcases the percentage of teledensity from 2017 to 2022.

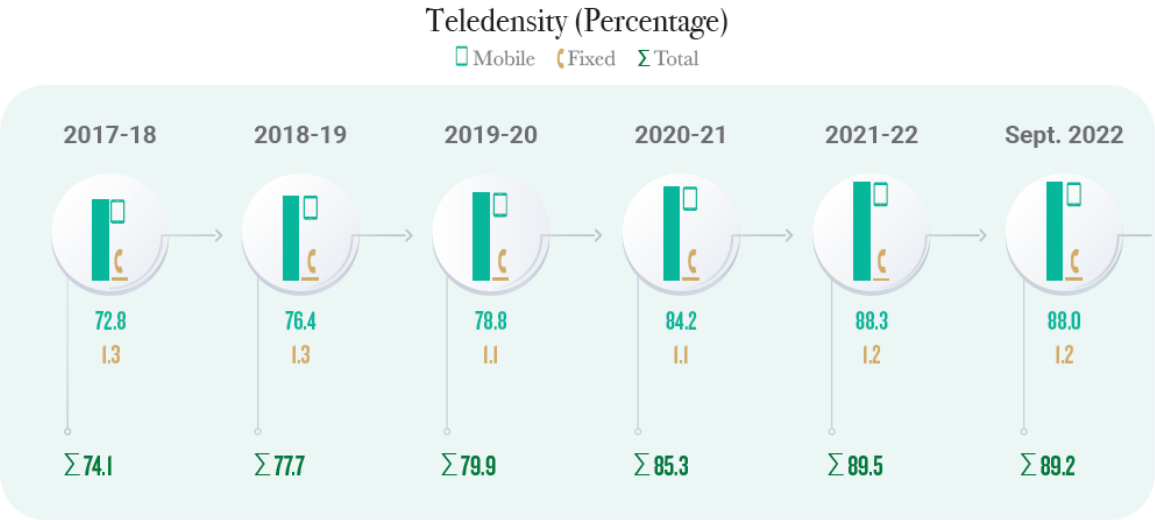


FIGURE 8: Teledensity (Percentage)

Source: (Annual Reports | PTA, 2022)

4.2.1. Rural Urban Inter State Digital Divide in Pakistan

Pakistan exhibits a noticeable digital divide in inter-state accessibility. The Pakistan Telecommunication Authority (PTA) highlights Punjab with the highest internet penetration rate at 51 percent, followed by Sindh at 37 percent, Khyber Pakhtunkhwa at 25 percent, and Balochistan at 14 percent.[45] Moreover, internet penetration rates vary within regions of each province, indicating significant disparities. This inter-state gap mirrors unequal resource distribution, development, and governance, creating a divide

[45] "Pakistan Telecommunication Authority. *Annual Report 2022.*" (Islamabad: Pakistan Telecommunication Authority, 2023), https://www.pta.gov.pk/assets/media/pta_annual_report_2022_10012023.pdf.

between prosperous and less developed regions. The Pakistan Social and Living Standards Measurement (PSLM) report highlights a widening rural-urban teledensity gap over time.[46] Although rural teledensity has increased since 2000, the growth is notably less compared to urban teledensity, exemplified by Islamabad.

For province-wise analysis following three indicators of ICT have been included to conduct the analysis:

- Household with Computer/Laptop/Tablet
- Household with Mobile Phone
- Household with Internet

4.2.1.1. Household with Computer/Laptop/Tablet

According to PSLM data, only 11.75 percent of Pakistani households have access to computer/laptop/tablet devices. Punjab and Khyber Pakhtunkhwa have slightly higher percentages at 12.9 percent and 12.37 percent, respectively.[47] Urban areas in these provinces have higher adoption rates than rural areas. Sindh has the most significant gap between urban and rural households. Balochistan has the lowest percentages with an overall figure of 6.45 percent, with urban households at 12.95 percent, and rural households at only 4.03 percent.[48] This data highlights the uneven distribution of digital access, emphasising the need for targeted interventions to bridge the digital divide.

[46] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

[47] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

[48] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

Percentage of Household with Computer/Laptop/Tablet					
Province	**Computer/ Laptop/Tablet**	**Rural Province**	**Computer/ Laptop/Tablet**	**Urban Province**	**Computer/ Laptop/ Tablet**
Pakistan	11.75	**Pakistan**	6.92	**Pakistan**	19.42
Punjab	12.9	**Punjab**	7.6	**Punjab**	21.61
Sindh	10.18	**Sindh**	3.04	**Sindh**	15.94
KP	12.37	**KP**	9.72	**KP**	26.46
Balochistan	6.45	**Balochistan**	4.03	**Balochistan**	12.95

TABLE 2: Percentage of Household with Computer/Laptop/Tablet

Source: Calculated using data from PSLM (2019-2020)[49]

4.2.1.2. Household with Mobile Phone

Pakistan has a high mobile technology penetration rate of 93.15 percent, indicating that the majority of households possess at least one mobile or smart device. Punjab and Khyber Pakhtunkhwa provinces exhibit commendable overall rates of 93.93 percent and 94.94 percent, respectively, with relatively consistent spread of internet access across both urban and rural settings. However, Sindh province demonstrates a significant urban-rural divide with a provincial average of 90.85 percent and rural areas falling considerably behind at 84.08 percent. Balochistan registered a commendable overall rate of 91.88 percent with urban areas reporting a high rate of 96.13 percent. Nonetheless, data shows that not everyone has equal access to mobile technology, highlighting a concerning gap in access and potentially indicating systemic barriers in certain areas. Addressing this issue calls for targeted actions to ensure that everyone has access to technological resources.

[49] Pakistan Bureau of Statistics (PBS), "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

Percentage of Household with Mobile/Smart Device					
Province	**Mobile/ Smart Device**	**Rural Province**	**Mobile/ Smart Device**	**Urban Province**	**Mobile/ Smart Device**
Pakistan	93.15	**Pakistan**	91.06	**Pakistan**	96.46
Punjab	93.93	**Punjab**	92.38	**Punjab**	96.47
Sindh	90.85	**Sindh**	84.08	**Sindh**	96.32
KP	94.94	**KP**	94.46	**KP**	97.52
Balochistan	91.88	**Balochistan**	90.3	**Balochistan**	96.13

TABLE 3: Percentage of Household with Mobile/Smart Device

Source: Calculated using data from PSLM (2019-2020)[50]

4.2.1.3. Household with Internet

Access to the internet in Pakistan varies significantly across regions, with around 1 in 3 households having internet access nationally. The province of Punjab boasts the highest rates of internet access, with urban areas nearing 50 percent, while villages in this and other provinces have significantly lower rates. The province of Sindh highlights a significant gap, with cities enjoying high levels of access while villages lack adequate access. In Balochistan, both cities and villages fall below the national average. This digital divide results in limited access to crucial benefits of the internet, including education, employment opportunities, and social connections.

[50] Pakistan Bureau of Statistics (PBS), "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

Percentage of Household with Internet					
Province	**Internet**	**Rural Province**	**Internet**	**Urban Province**	**Internet**
Pakistan	32.77	**Pakistan**	23.32	**Pakistan**	47.76
Punjab	34.4	**Punjab**	25.14	**Punjab**	49.61
Sindh	31.92	**Sindh**	14.33	**Sindh**	46.11
Khyber Pakhtunkhwa	32.72	**Khyber Pakhtunkhwa**	29.07	**Khyber Pakhtunkhwa**	52.09
Balochistan	21.15	**Balochistan**	17.13	**Balochistan**	31.97

TABLE 4: Percentage of Household with Internet

Source: Calculated using data from PSLM (2019-2020)[51]

The graphical exploration of the analysis entailing the percentage of household with Computer, Mobile and Internet across Pakistan has been shown below:

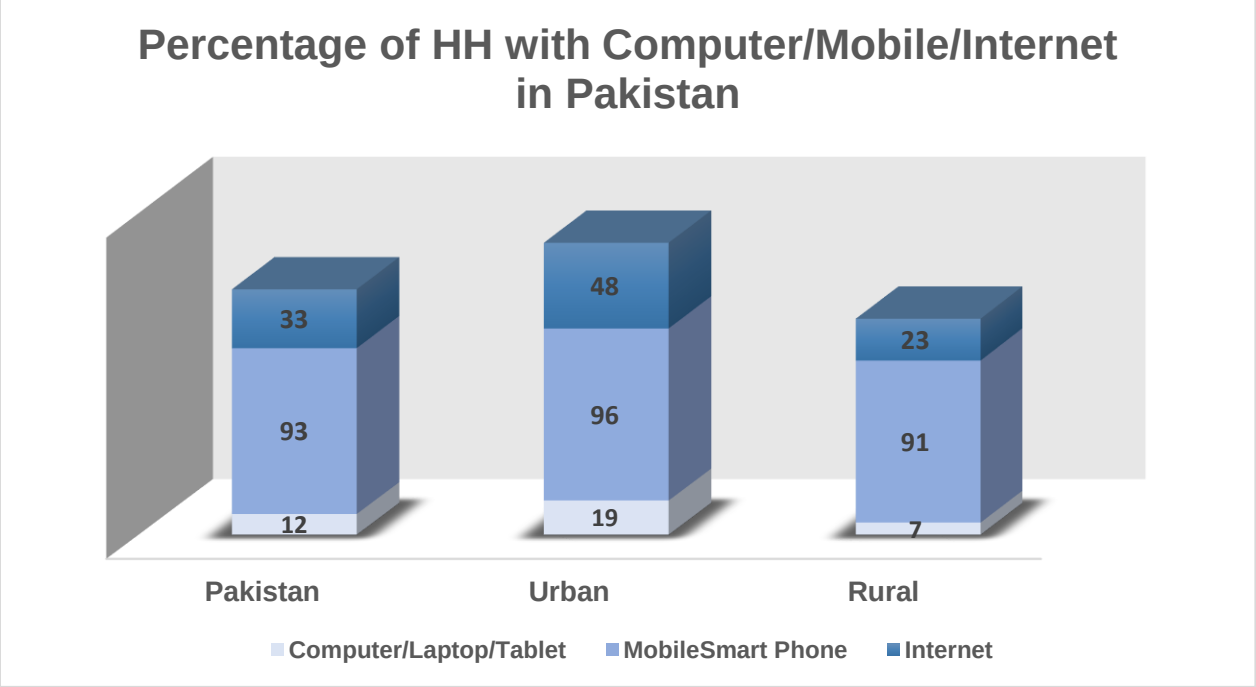


FIGURE 9: Percentage of HH with Computer/Mobile/Internet in Pakistan

Source: Calculated using data from PSLM (2019-2020)[52]

[51] Pakistan Bureau of Statistics (PBS), "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

[52] Pakistan Bureau of Statistics (PBS), "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019,

The graphical representation of the three indicators has been analysed by province and is attached in the Appendix A.

4.2.2. Uneven Progress: A Spatial Analysis of Mobile Phone Ownership in Pakistan using PSLM Data[53]

4.2.2.1. National Disparities:

- **Gender Divide:** Male ownership rates (65.02 percent) significantly surpass female ownership (25.19 percent), emphasising the necessity for targeted interventions addressing gender-based barriers to mobile phone access.
- **Urban-Rural Divide:** Urban areas exhibit notably higher ownership rates compared to rural areas (71 percent vs. 61 percent in males) and (38 percent vs 17 percent in females), highlighting challenges stemming from inadequate infrastructure and limited affordability in rural mobile phone penetration.

4.2.2.2. Provincial Variations:

- **Sindh Leads:** Sindh has the highest male mobile ownership rate in urban areas at 75 percent, followed by Punjab, KP, and Balochistan. In rural areas of KP, male ownership is highest at 63 percent, followed by Balochistan, Punjab, and Sindh.
- **Female ownership varies by province:** In urban areas, Sindh has the highest percentage at 44 percent, followed by Punjab, KP, and Balochistan. In rural areas,

https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

[53] Pakistan Bureau of Statistics (PBS), "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

KP has the highest percentage at 21 percent, followed by Punjab, Balochistan, and Sindh.

- **Disparities Within Provinces:** Sindh leads with the highest ownership rate (49 percent), followed by Punjab (45 percent), KP, and Balochistan, necessitating region-specific strategies to narrow the gap.
- See Appendix B for graphical representation.

Percentage of Urban Individuals with Mobile Ownership				
Provinces	Male	Female	Ranking of Male Ownership	Ranking of Female Ownership
Pakistan	71	38		
Punjab	69	36	3	2
Sindh	75	44	1	1
KP	71	30	2	3
Balochistan	67	23	4	4
Percentage of Rural Individuals with Mobile Ownership				
Provinces	Male	Female	Ranking of Male Ownership	Ranking of Female Ownership
Pakistan	61	17		
Punjab	61	19	3	2
Sindh	58	9	4	4
KP	63	21	1	1
Balochistan	62	11	2	3
Percentage of Individuals with Mobile Ownership Across Provinces				
Provinces	Male	Female	Ranking of Male Ownership	Ranking of Female Ownership
Pakistan	65	25		
Punjab	64	25	2	2
Sindh	67	29	1	1
KP	64	23	2	3
Balochistan	63	15	3	4

TABLE 5: Percentage of Mobile Ownership

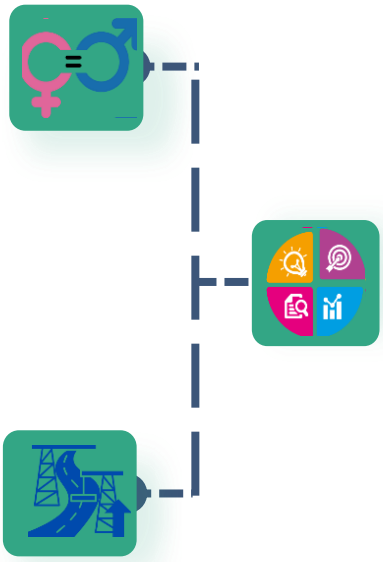
Source: Calculated using data from PSLM (2019-2020)[54]

[54] Pakistan Bureau of Statistics (PBS), "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

4.2.2.3. Policy Implications:

The data point out the need for a multi-pronged approach to address the uneven distribution of mobile phone ownership in Pakistan:

Bridging the Gender Gap:
Targeted initiatives promoting female digital literacy, mobile phone affordability programs for women, and addressing socio-cultural barriers are crucial to empower women and ensure their equitable access to mobile technologies.



Province-Specific Strategies:
Acknowledging the varied dynamics within each province, policymakers should tailor interventions to address the specific challenges and opportunities unique to each region. This may involve public-private partnerships, community-based initiatives, and leveraging local knowledge to overcome infrastructural and cultural barriers.

Rural Infrastructure:
Expanding mobile network coverage, investing in renewable energy sources to power rural telecom infrastructure, and promoting affordable data plans are essential to bridge the digital divide between urban and rural areas.

4.2.3. From Sindh's Heights to Balochistan's Depths: Navigating Pakistan's Uneven Digital Landscape

The data shows the internet penetration rates in urban and rural locales across Pakistan, distinguished by gender and the graphical representation is given in Appendix C:

- **Urban Access**: Sindh leads for both males (39 percent) and females (27 percent), followed by Punjab. KP and Balochistan lag, particularly for females.
- **Rural Access**: KP dominates male access at 18.8 percent, whilst Punjab leads for females at 9 percent. Both Balochistan and Sindh report notably lower figures.

Analysis of the ranking of internet penetration across provinces by gender can be seen as:

Sindh consistently secures the top position in internet access except for rural population, while Balochistan mostly ranks last, indicating the need for developmental initiatives to bolster digital inclusivity in the province. Punjab and KP demonstrate variable standings, emphasising the heterogeneity in internet access across terrains. These findings highlight the need for targeted interventions to bridge the digital divide and ensure equitable access to information and communication technologies across Pakistan by gender.

Percentage of Urban Individuals with Internet				
Provinces	Male	Female	Ranking of Provinces with Urban Male Individuals having internet	Ranking of Provinces with Urban Female Individuals having internet
Pakistan	37	24		
Punjab	36	25	2	2
Sindh	39	27	1	1
KP	36	13	2	3
Balochistan	29	12	3	4
Percentage of Rural Individuals with Internet				
Provinces	Male	Female	Ranking of Provinces with Rural Male Individuals having internet	Ranking of Provinces with Rural Female Individuals having internet
Pakistan	16	7		
Punjab	16	9	3	1
Sindh	12	3	4	4
KP	19	6	1	2
Balochistan	17	5	2	3
Percentage of Individuals with Internet across Provinces				
Provinces	Male	Female	Ranking of Provinces with Total Male Individuals having internet	Ranking of Provinces with Total Female Individuals having internet
Pakistan	24	14		
Punjab	24	15	2	2
Sindh	27	16	1	1
KP	22	7	3	3
Balochistan	21	7	4	3

TABLE 6: Percentage of Internet Penetration Rates by Gender

Source: Calculated using data from PSLM (2019-2020)[55]

[55] Pakistan Bureau of Statistics (PBS), "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

4.3. Province-Wise ICT Scores in Pakistan: A Provincial Analysis

In Punjab, the mean Information and Communication Technology (ICT) score is 5.11, with over half (19/36) of districts exceeding this mean, suggesting a relative preponderance of ICT access. Conversely, 17 districts score below this mean, and a singular district achieves Category A status, indicative of superior ICT infrastructure. The majority (30/36) are classified within Categories B and C, with 5 districts encountering substantial challenges, as denoted by Category D.

In Sindh, the mean ICT score is slightly lower at 4.71. Approximately 38 percent (11/29) of districts surpass this benchmark, while 62 percent (18/29) fall below, demonstrating a digital divide. A minimal fraction (2/29) reach Category A status, with a majority (12/29) in Categories B and C, and a significant portion (13/29) in Category D, alongside 2 districts in the most concerning condition, Category E.

Khyber Pakhtunkhwa (KP) presents a mean ICT score of 5.09, with 62.5 percent (20/32) of districts above this average, indicating favourable ICT access. However, 12 districts do not meet this average, reflecting uneven distribution. Notably, no district meets Category A standards; the majority (26/32) are in Categories B and C, and a minority (6/32) are in Category D. Peshawar stands out with a high score of 6.39, juxtaposed by South Waziristan's low score of 3.50.

In Balochistan, the mean ICT score is 4.49, with less than half (13/28) of districts above the mean, signalling moderate ICT access, and over half (15/28) below, denoting a significant digital gap. No district reaches Category A, with the majority (12/28) in Categories B and C, and a notable portion (15/28) facing considerable difficulties in Categories D and E. The ICT scores across provinces are:

Province	Average ICT Score	Districts Above Average	Districts Below Average	Category A (Excellent)	Category B & C (Moderate)	Category D (Challenges)	Category E (Worst)
Punjab	5.11	19	17	1	30	5	-
Sindh	4.71	11	18	2	12	13	2
Khyber Pakhtunkhwa	5.09	20	12	-	26	6	-
Balochistan	4.49	13	15	-	12	15	-

TABLE 7: Province Wise ICT Score

Source: Calculated using data from PSLM (2019-2020)[56]

These scores highlight the disparities in ICT access across provinces and demonstrate the need for targeted interventions to bridge the digital divide in Pakistan. Moreover, the ICT scores of all provinces at the district level are given in the Appendix D1, D2, D3, and D4.

5. POLICY RECOMMENDATIONS

To promote inclusive ICT access in rural Pakistan, various strategies and policies can be implemented, focusing on infrastructure, digital literacy, affordability, local content development, public-private partnerships, regulatory reforms, and gender inclusion:

[56] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

5.1. Enhancing Infrastructure: Prioritise broadband expansion, extend mobile connectivity, establish community technology centres, and invest in infrastructure through public-private partnerships. The government and the private sector should expand and upgrade the ICT infrastructure in rural areas, such as by deploying fibre optic cables, wireless networks, satellite systems, and renewable energy sources. The Universal Service Fund (USF), which is a public-private partnership that aims to provide ICT services to underserved areas, is an example of such an initiative.[57] The USF has funded several projects to improve the broadband and mobile coverage in rural areas of Pakistan.

5.2. Digital Literacy Programmes: Integrate digital literacy into school curricula, conduct adult training workshops, and enhance literacy and digital skills through public-private partnerships. For instance, the Ignite, which is a public-private partnership supports innovation and entrepreneurship in ICTs, is an example of such an initiative[58]. The Ignite has launched several projects to enhance the digital skills of rural users, such as by providing online courses, mobile apps, and digital libraries.

[57] Ministry of Information Technology, "USF | Universal Service Fund Pakistan," USF | Universal Service Fund Pakistan, 2005, https://www.usf.org.pk/about-us#:~:text=MISSION%20%26%20VISION.

[58] Ignite, "IGNITING INNOVATION in PAKISTAN Y E A R B O O K 2 0 1 8," 2018, https://ignite.org.pk/wp-content/uploads/2019/09/Ignite-YearBook2018.pdf.

5.3. Affordable Devices and Services: Provide subsidised devices, offer affordable data plans, and reduce the cost of ICTs through government initiatives. The government and the private sector need to work together to lower the cost of ICT devices and services, such as by reducing taxes, tariffs, and fees, increasing competition and innovation, and offering subsidies and incentives. The Digital Pakistan Policy, is a framework for the development of the digital economy and society, is an example of such an initiative.[59] The policy proposes various measures to improve the affordability and accessibility of ICTs, such as by rationalising taxes, promoting local manufacturing, and providing free public Wi-Fi.

5.4. Local Content Development: Encourage vernacular content, develop platforms for agricultural and livelihood information, and increase content and language diversity through public-private partnerships. For instance, farmers from rural areas of Sindh like Lower Dir. Sanghar and Layyah have been successfully using their smartphones to find and learn from online resources. Apps like ‘Bakhabar Kissan’ and ‘Engro E-Kissan’ have helped these farmers gain information about their crops along with weather updates and tips on disaster management.[60] The National Incubation Centre (NIC), is an example of such an initiative.[61] The NIC has incubated several start-ups that create and offer digital content and services for rural users, such as by providing e-commerce, e-health, e-education, and e-agriculture solutions.

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5.5. Public-Private Partnerships: Engage private sector for infrastructure development and service provision, and promote corporate social responsibility for digital inclusion efforts

5.6. Regulatory Reforms: Streamline licencing procedures, optimise the Universal Service Fund (USF), and address gender and social norms through collaboration with international organisations. The UNESCO, which is an international organisation that promotes education, science, and culture, is an example of such an initiative.[62] The UNESCO has supported the formulation of the digital inclusion and gender mainstreaming strategy for Pakistan, which aims to promote access to information and empowerment of women and girls through ICTs.

5.7. Data Privacy and Security: Conduct awareness campaigns, regulate data handling, and safeguard user information through robust data protection laws.

[59]Ministry of IT & Telecom, "Digital Pakistan Policy," 2018, https://moib.gov.pk/Downloads/Policy/DIGITAL_PAKISTAN_POLICY%2822-05-2018%29.pdf.

[60]Ministry of IT & Telecom, "Digital Pakistan Policy," 2018, https://moib.gov.pk/Downloads/Policy/DIGITAL_PAKISTAN_POLICY%2822-05-2018%29.pdf.

[61] "Home," National Incubation Centre Karachi, 2016, https://www.nickarachi.com/.

[62] PTA, "UNESCO to Collaborate with Pakistan Telecommunication Authority on Digital Inclusion and Gender Mainstreaming Strategy," Unesco.org, 2022, https://www.unesco.org/en/articles/unesco-collaborate-pakistan-telecommunication-authority-digital-inclusion-and-gender-mainstreaming.

6. CONCLUSION

It can be concluded that the paper emphasises the vital importance of addressing Pakistan's urban-rural digital divide, impacting the nation's socio-economic development and pursuit of universal digital inclusivity. Despite progress in urban ICT sectors, disparities in access, infrastructure, and digital literacy persist in rural areas, challenging the nation's commitment to equitable ICT access, especially in light of the Sustainable Development Goals' (SDGs) target 9.c for universal digital inclusivity by 2030.

Pakistan's ICT sector reflects significant progresses, notably through the "Digital Pakistan Policy" and "Digital Pakistan Vision." However, persistent challenges, particularly in rural areas, including limited connectivity, literacy deficits, and economic barriers, hinder overall progress. Global comparative analyses, especially the E-Government Development Index (EGDI), highlight Pakistan's lag behind South Asian counterparts, primarily due to deficiencies in ICT infrastructure, human capital, and online service availability.

Examining EGDI components—Online Service Index (OSI), Human Capital Index (HCI), and Telecommunication Infrastructure Index (TII)—reveals the root causes of Pakistan's digital divide. While progress have been made in online service availability, challenges persist in human capital development and telecommunication infrastructure, especially in rural regions. Yearly analyses provide a dynamic perspective, highlighting fluctuations and the need for sustained efforts and targeted interventions.

Pakistan exhibits multidimensional geographic and demographic disparities in internet accessibility, encompassing urban-rural divides, varying provincial penetration rates, gender disparities, and challenges in digital literacy and education. Barriers to

inclusivity, such as infrastructure limitations, affordability issues, and gender norms, further exacerbate the digital gap. Teledensity, a crucial indicator, demonstrates progress but also reveals the need for focused efforts to ensure equitable access to digital resources.

Resolving the urban-rural digital gap requires policy recommendations, such as focused investments in rural ICT infrastructure, initiatives to boost digital literacy and skills, and actions to tackle affordability challenges. Improving online service availability, especially in local languages, can enrich the value of ICT for rural users. Moreover, holistic efforts are essential to address gender disparities in ICT access, necessitating the promotion of digital literacy, ensuring safety, and providing pertinent content.

Tackling Pakistan's urban-rural digital divide demands a comprehensive and sustained approach, necessitating cooperation among policymakers, industry stakeholders, and the community. Implementing targeted interventions, investing in infrastructure, and promoting digital literacy offer potential benefits beyond national borders, contributing to the global aim of achieving universal digital inclusivity and leveraging ICTs for socio-economic progress.

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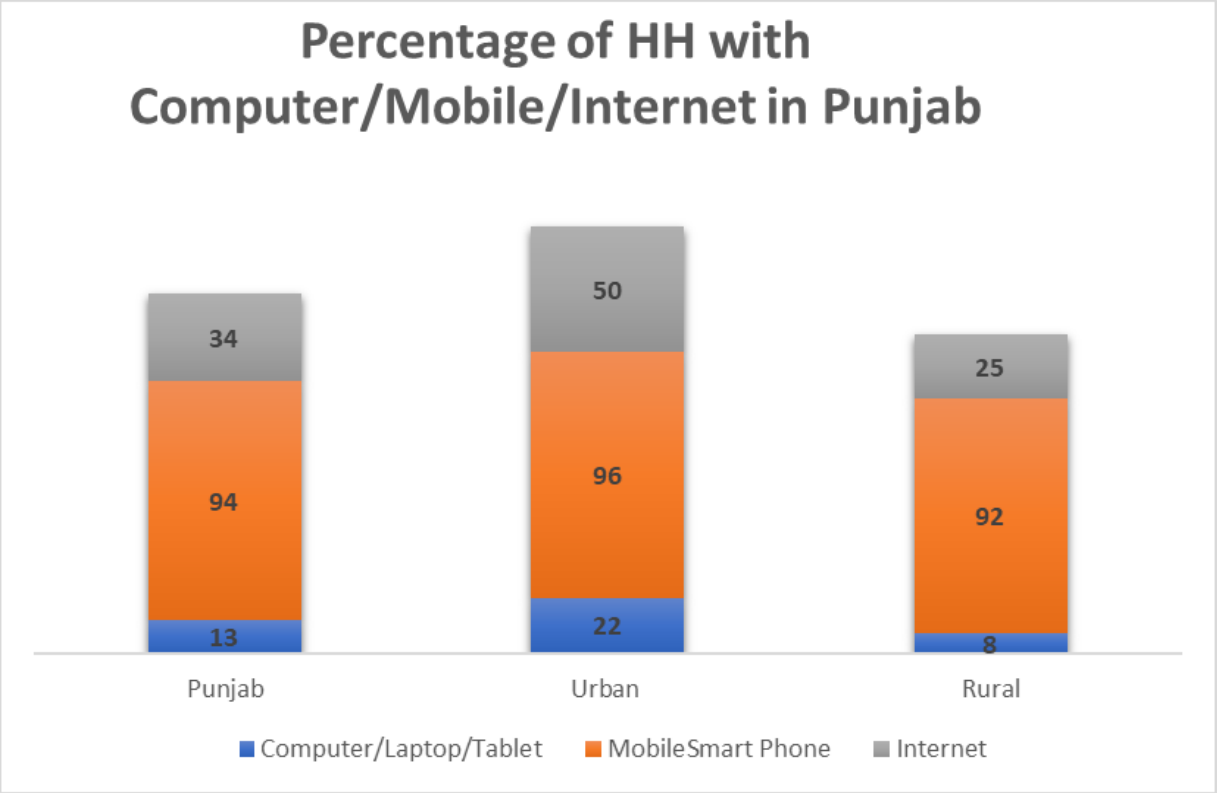
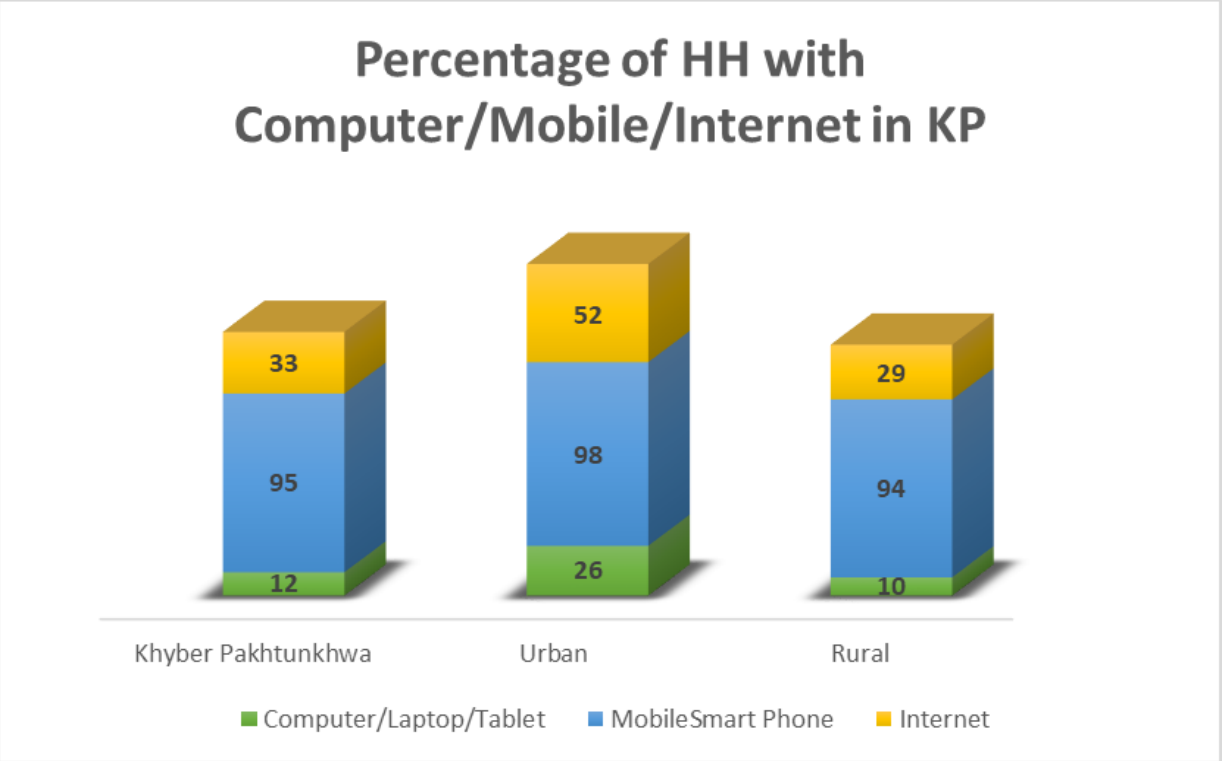
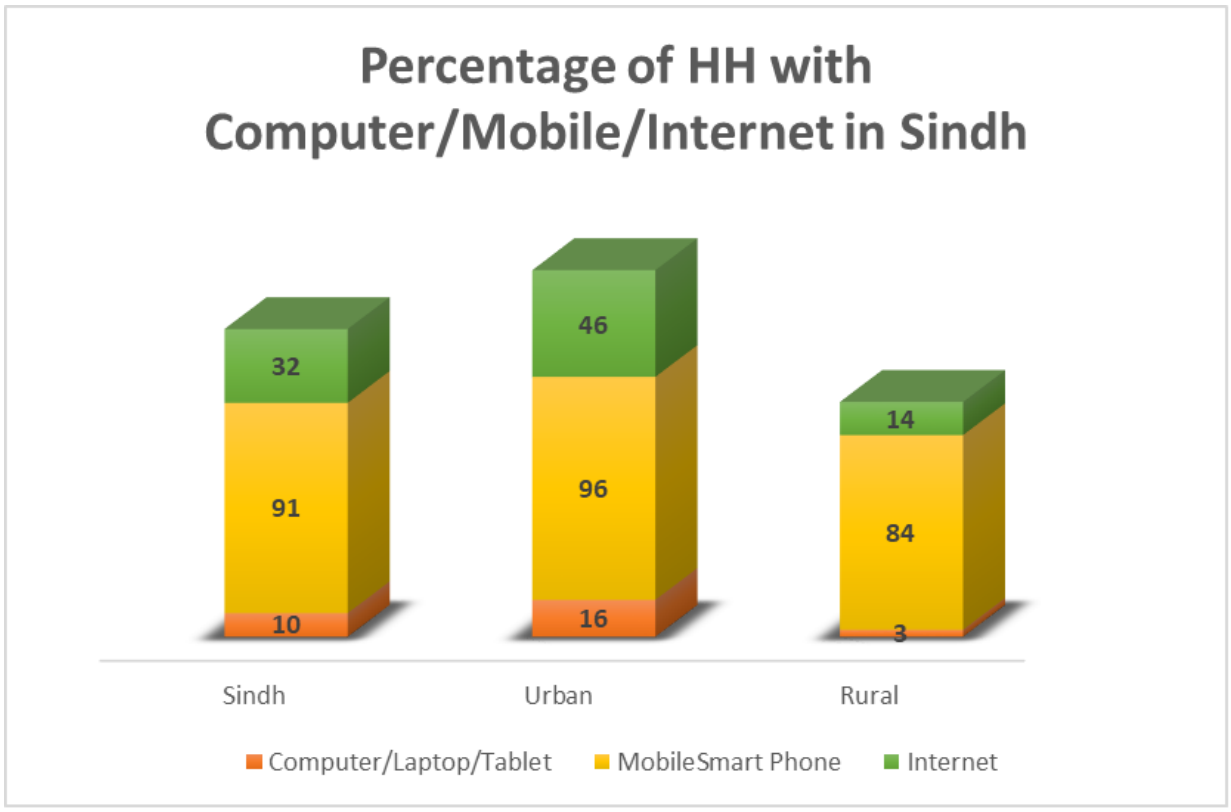
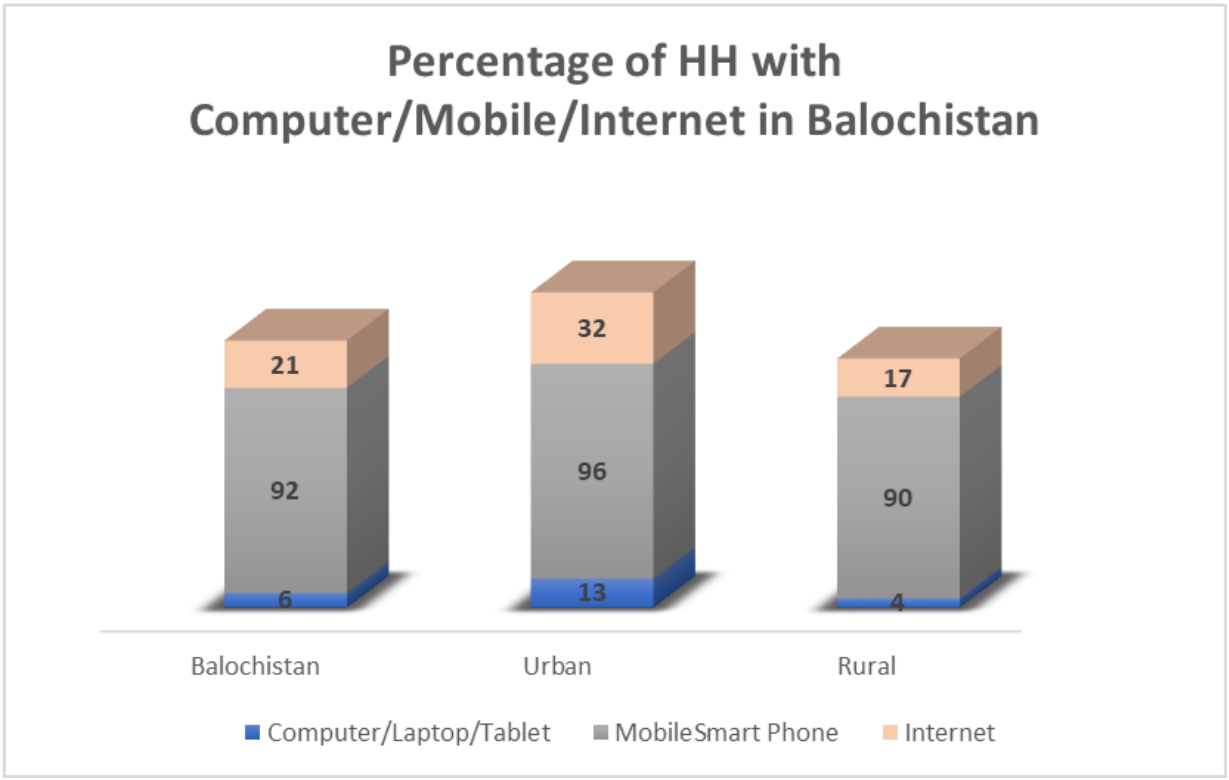
APPENDIX A

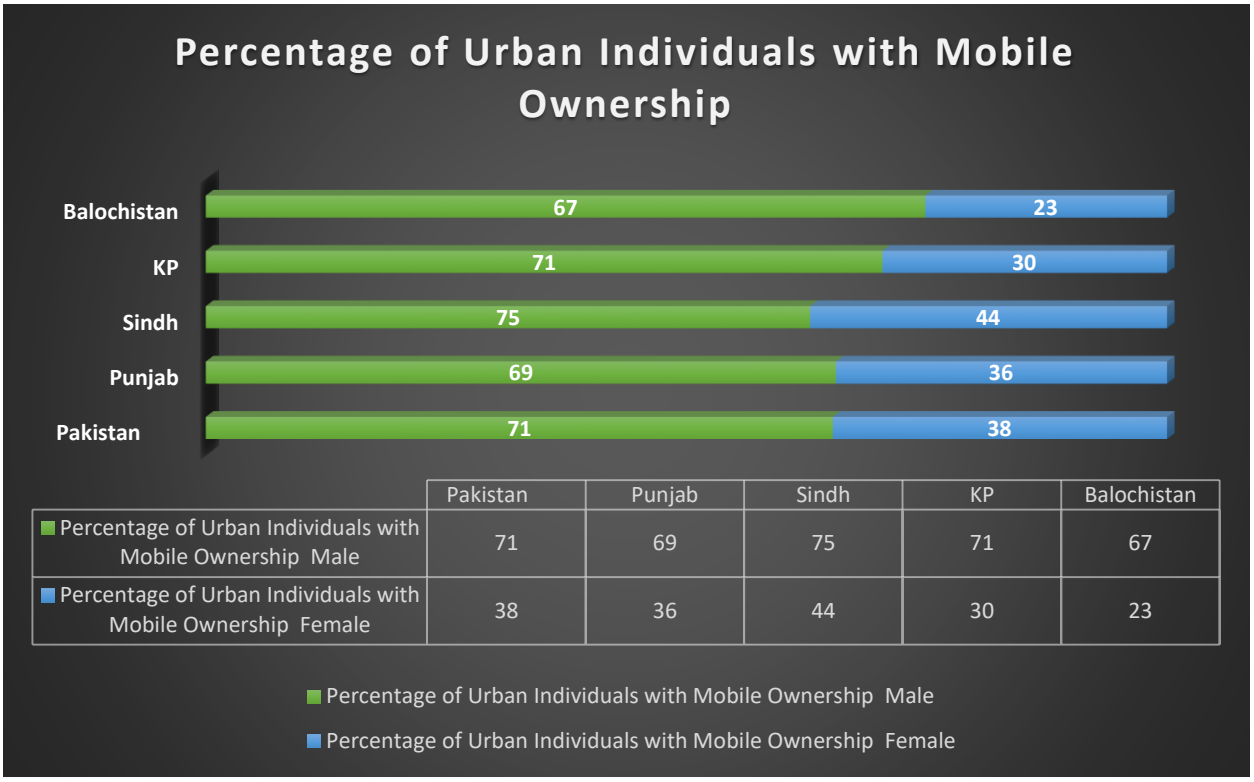

Percentage of HH with Computer/Mobile/Internet in Punjab
34
94
13
50
96
22
25
92
8
Punjab
Urban
Rural
Computer/Laptop/Tablet
MobileSmart Phone
Internet


Percentage of HH with Computer/Mobile/Internet in KP
33
95
12
52
98
26
29
94
10
Khyber Pakhtunkhwa
Urban
Rural
Computer/Laptop/Tablet
MobileSmart Phone
Internet

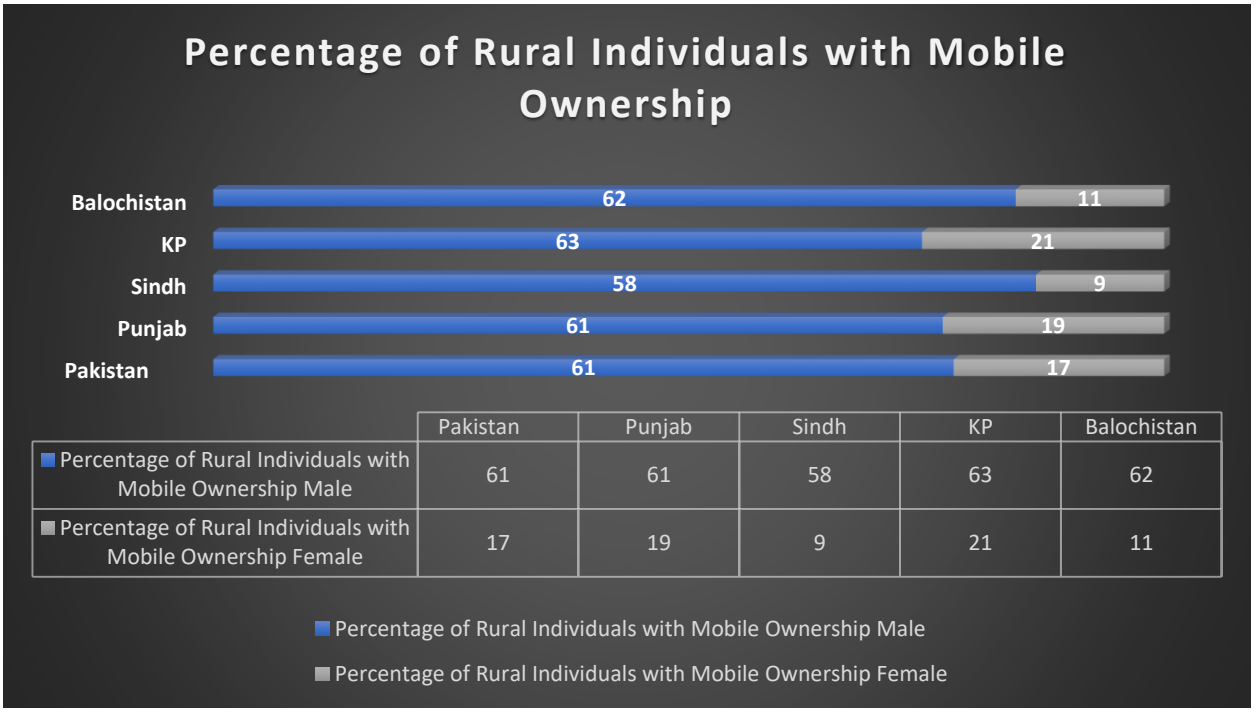

Percentage of HH with Computer/Mobile/Internet in Sindh
32
91
10
46
96
16
14
84
3
Sindh
Urban
Rural
Computer/Laptop/Tablet
MobileSmart Phone
Internet


Percentage of HH with Computer/Mobile/Internet in Balochistan
21
92
6
32
96
13
17
90
4
Balochistan
Urban
Rural
Computer/Laptop/Tablet
MobileSmart Phone
Internet

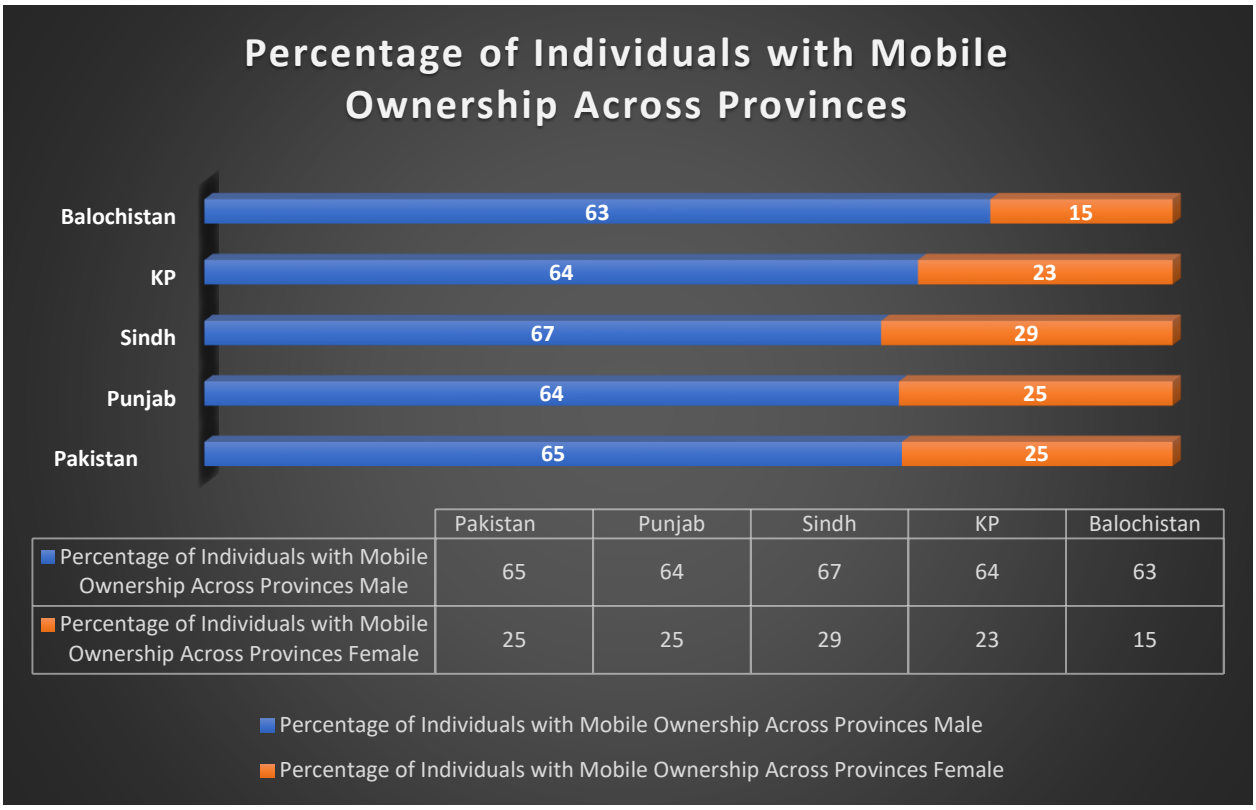
APPENDIX B



	Pakistan	Punjab	Sindh	KP	Balochistan
Percentage of Urban Individuals with Mobile Ownership Male	71	69	75	71	67
Percentage of Urban Individuals with Mobile Ownership Female	38	36	44	30	23

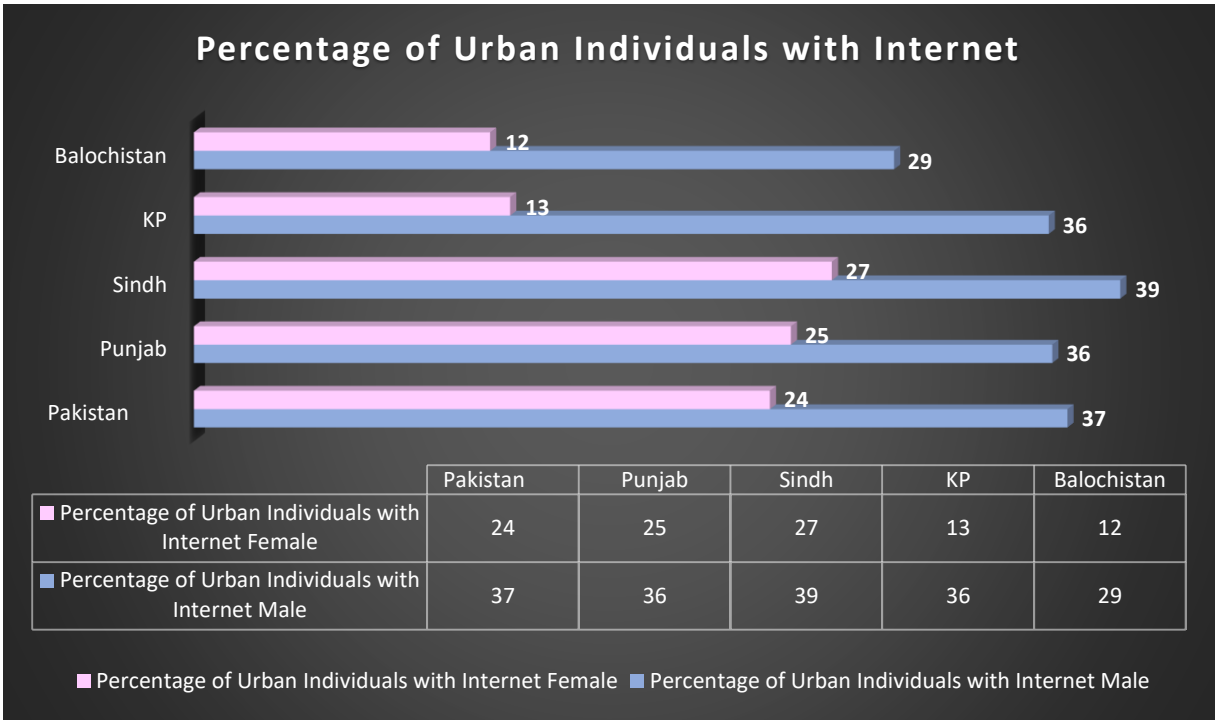


	Pakistan	Punjab	Sindh	KP	Balochistan
Percentage of Rural Individuals with Mobile Ownership Male	61	61	58	63	62
Percentage of Rural Individuals with Mobile Ownership Female	17	19	9	21	11

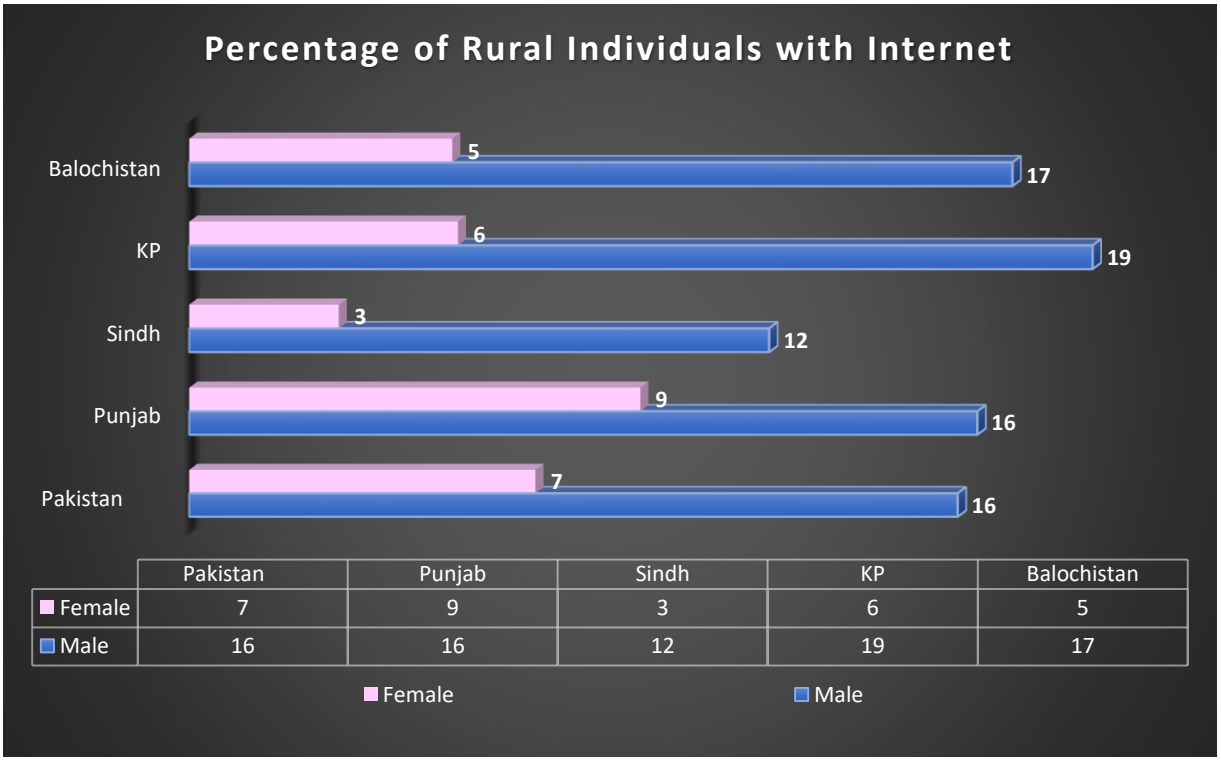


	Pakistan	Punjab	Sindh	KP	Balochistan
Percentage of Individuals with Mobile Ownership Across Provinces Male	65	64	67	64	63
Percentage of Individuals with Mobile Ownership Across Provinces Female	25	25	29	23	15

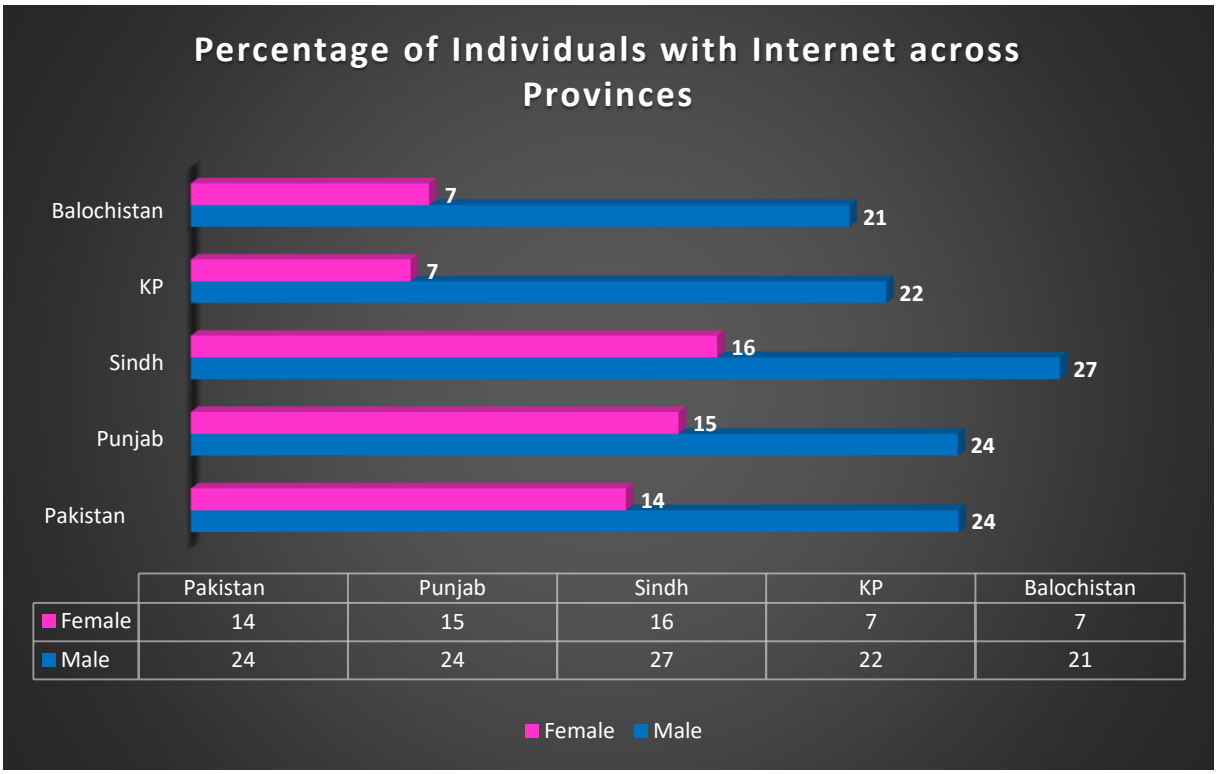
APPENDIX C



	Pakistan	Punjab	Sindh	KP	Balochistan
Percentage of Urban Individuals with Internet Female	24	25	27	13	12
Percentage of Urban Individuals with Internet Male	37	36	39	36	29

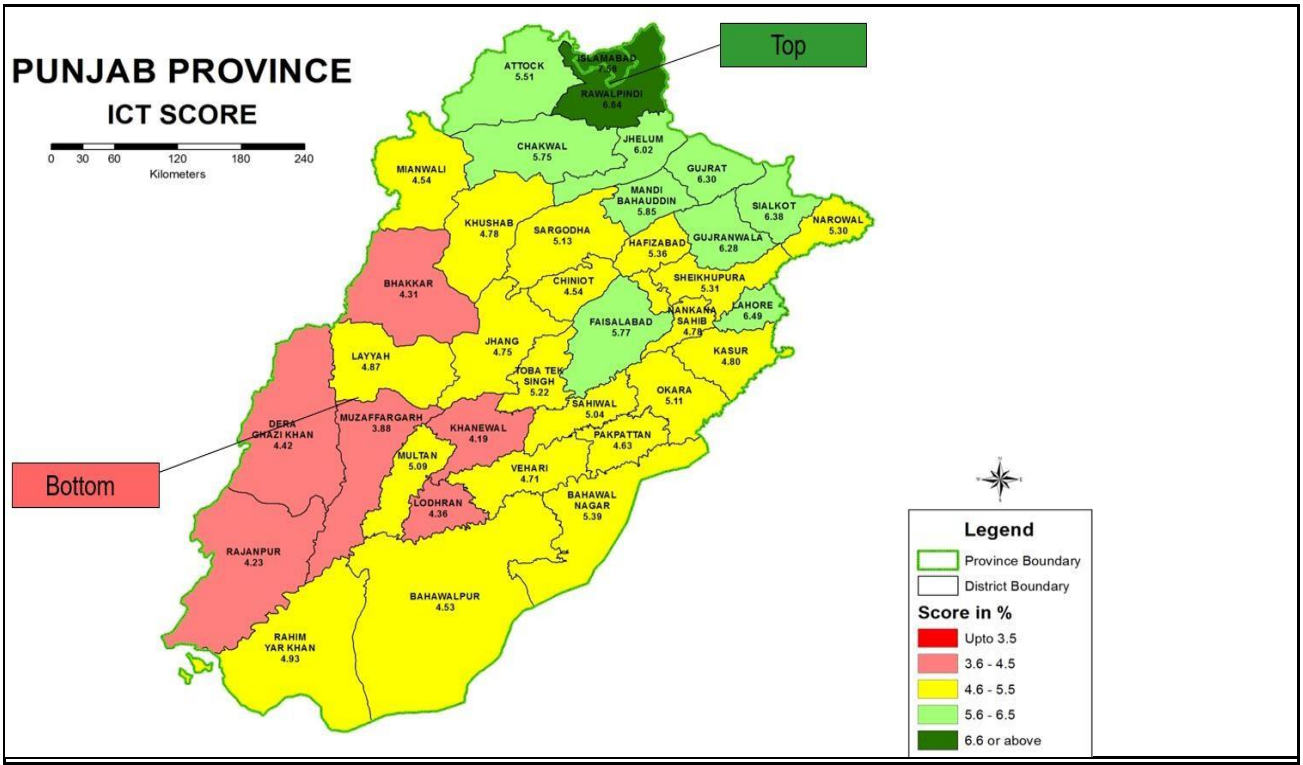


	Pakistan	Punjab	Sindh	KP	Balochistan
Female	7	9	3	6	5
Male	16	16	12	19	17



	Pakistan	Punjab	Sindh	KP	Balochistan
Female	14	15	16	7	7
Male	24	24	27	22	21

APPENDIX D1



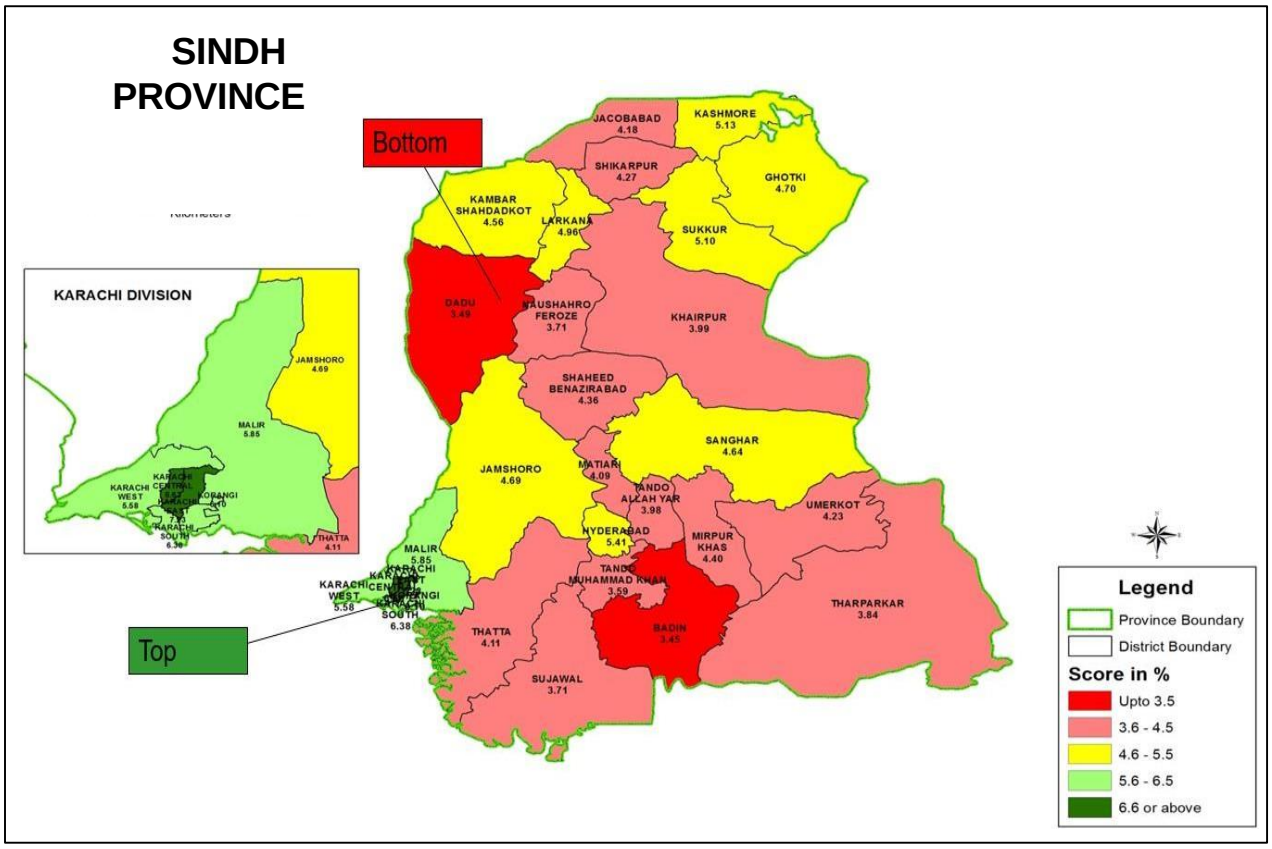
Score	Grade	Colour	District
6.6 or Above	A		1
5.6- 6.5	B		9
4.6-5.5	C		21
3.6-4.5	D		5
upto 3.5	E		0
Total Districts			36

FIGURE 10: Punjab ICT Score

Source: PSLM (2019-2020)[63]

[63] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

APPENDIX D2



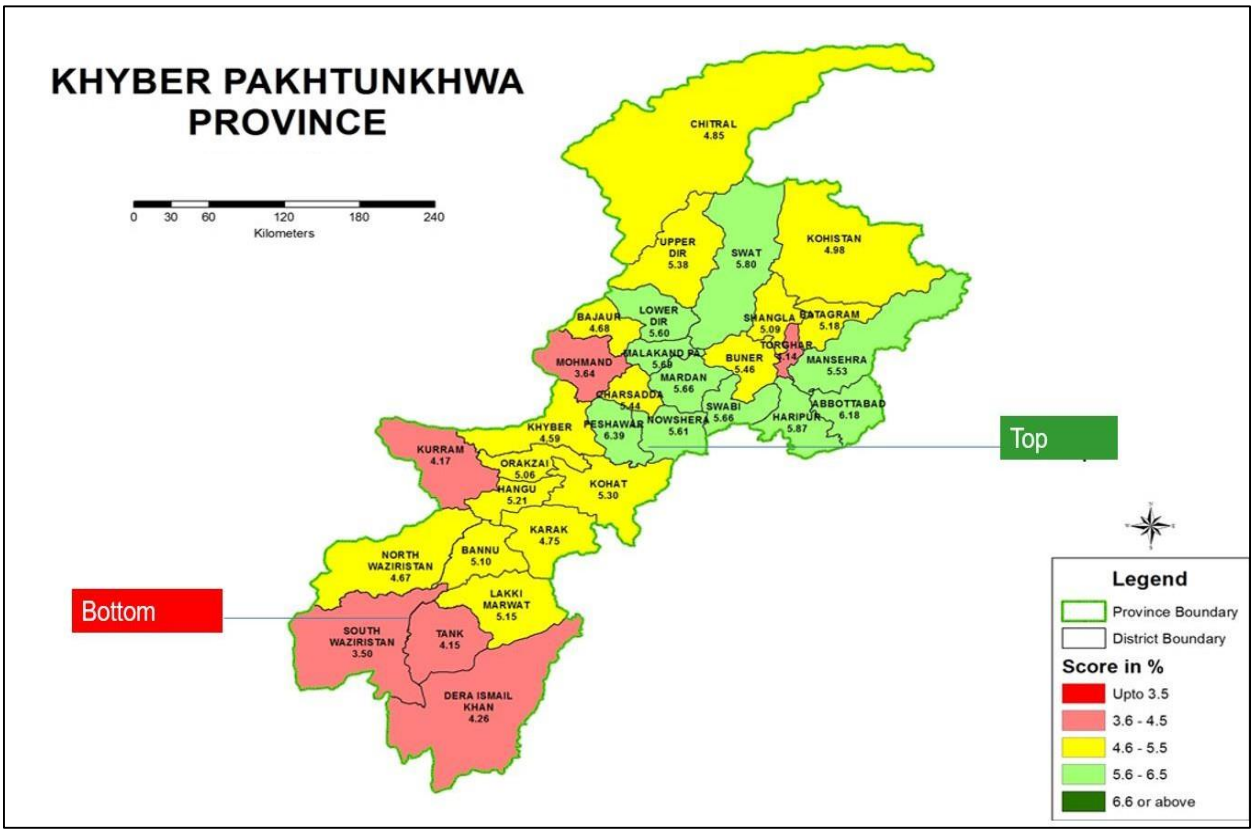
Score	Grade	Colour	Districts
6.6 or Above	A		2
5.6- 6.5	B		4
4.6-5.5	C		8
3.6-4.5	D		13
upto 3.5	E		2
Total Districts			29

FIGURE 11: Sindh ICT Score

Source: PSLM (2019-2020)[64]

[64] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

APPENDIX D3



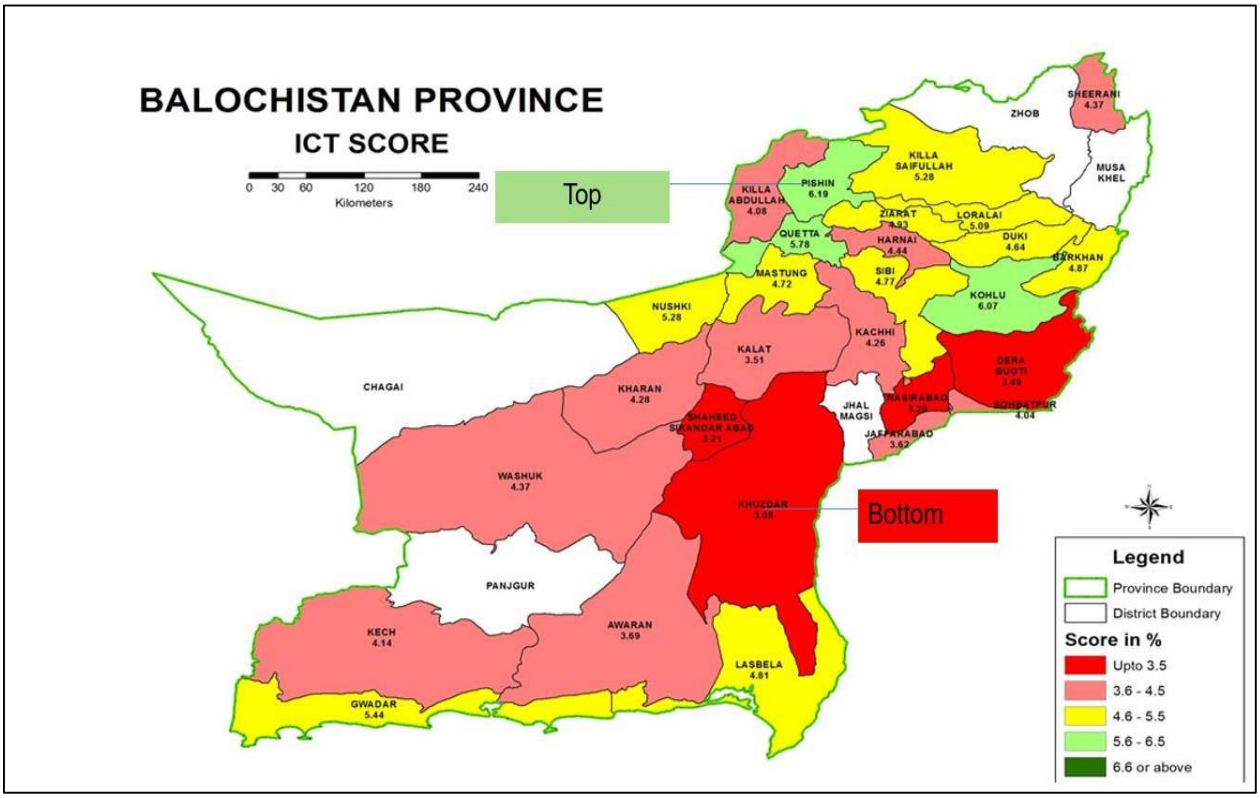
Score	Grade	Colour	District
6.6 or Above	A		0
5.6- 6.5	B		10
4.6-5.5	C		16
3.6-4.5	D		6
upto 3.5	E		0
Total Districts			32

FIGURE 12: Khyber Pakhtunkhwa ICT Score

Source: PSLM (2019-2020)[65]

[65] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.

APPENDIX D4



Score	Grade	Colour	Districts
6.6 or Above	A		0
5.6- 6.5	B		3
4.6-5.5	C		9
3.6-4.5	D		12
upto 3.5	E		4
Total Districts			28

FIGURE 13: Balochistan ICT Score
Source: PSLM (2019-2020)[66]

[66] PBS, "Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20 Provincial / District | Pakistan Bureau of Statistics," Pbs.gov.pk, 2019, https://www.pbs.gov.pk/publication/pakistan-social-and-living-standards-measurement-survey-pslm-2019-20-provincial.