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Connecting the Future: How Connectivity and AI Unlock New Potential

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Executive Summary

The transformative potential of Artificial Intelligence (AI) cannot be realized without comprehensive, resilient, and secure digital connectivity. As AI continues to reshape economies, governance, and societies, this white paper, building on the 2024 International Telecommunication Union (ITU) report *"The State of Broadband: Leveraging AI for Universal Connectivity,"*[1] argues that high-quality network infrastructure is not just complementary but foundational to trustworthy and widespread AI development. This paper explores the reciprocal relationship between AI and connectivity: AI demands advanced digital infrastructure to function, while also offering powerful tools to optimize and secure the very networks on which it depends. Without coordinated action, the uneven adoption of AI risks reinforcing the global digital divide, leaving developing economies increasingly behind.

1 Connectivity as a Prerequisite for AI

Chapter 1 outlines the critical role of physical and digital infrastructure in enabling AI systems. The successful development and deployment of AI depends on robust networks – across backbones and subsea cables (first mile), Internet Exchange Points (IXPs) and fiber (middle and last mile), and fixed wireless, Wi-Fi, mobile or satellite networks (last mile). These systems must be high-bandwidth, low-latency, and resilient to disruption. Equally important are cloud services, data centers, and edge computing systems that power real-time AI applications across sectors. Despite global gains, infrastructure remains uneven: high-income countries have made significant advances to support AI integration, while Least Developed Countries (LDCs) face major affordability and access gaps.

Policy Recommendations

1	Expand access to spectrum for wireless service, both licensed and unlicensed, and invest in resilient physical infrastructure (fiber, wireless, cloud, satellite).
2	Encourage public-private partnerships to close middle and last-mile gaps.
3	Expand IXPs and reduce regulatory barriers to Internet Service Provider (ISP) competition.
4	Support diverse energy generation and faster permitting for AI-ready data centers.
5	Expand access to digital public infrastructure and workforce training.

2 AI Enhancing Connectivity

AI does not just rely on networks – it also improves them. Chapter 2 explores how AI can optimize network performance, efficiency, and security. From real-time traffic routing and spectrum management to anomaly detection and predictive maintenance, AI enhances network resilience, security, and operational efficiency. This is particularly important in emerging markets, where intelligent automation can compensate for gaps in staffing, infrastructure, and resources.

Policy Recommendations

1	Promote adoption of AI for network and spectrum management.
2	Incentivize AI-driven energy and performance optimization for ISPs and cloud providers.
3	Promote adoption of AI-powered technologies to facilitate effective patch and update management.
4	Build cybersecurity frameworks aligned with AI-integrated architectures, including zero-trust models and privacy-by-design standards.
5	Leverage AI-enabled defenses to isolate, segment, and protect unpatched systems until updates or replacements can be applied.
6	Promote use of privacy-by-design standards for privacy-enhancing technologies (PETs), including de-identification and aggregation techniques for AI systems.

3 Closing the Digital Divide with AI

Chapter 3 focuses on the developmental opportunities and challenges of AI. AI can help close global gaps in education, healthcare, agriculture, and financial services. However, without digital access, underserved populations will be locked out of these benefits. Through case studies (e.g., Rwanda's healthcare chatbots, India's AI-powered telecom microgrids, and the UNICEF/ITU Giga initiative's school connectivity programs), this chapter underscores that targeted connectivity and AI initiatives can drive measurable social and economic gains.

Policy Recommendations

1	Governments: Streamline infrastructure licensing; expand spectrum availability; support trustworthy and secure technology deployment.
2	Private Sector: Lead infrastructure investment and scale AI literacy programs.
3	Public-Private Partnerships: Prioritize affordability and shared-use infrastructure.
4	International Organizations: Offer funding and data-driven diagnostics to guide last-mile investments and standards alignment.
5	Civil Society: Conduct research and support regional collaboration to expand access to AI.

AI is poised to become the defining technological force of the 21st century, but only if its foundations are sound. Connectivity is the backbone of AI, and widespread, secure infrastructure must be prioritized to reap the benefits of technological progress. Through coordinated investment, smart policy, and shared responsibility, AI can be harnessed to drive greater opportunity for all.

Introduction: Harnessing AI for Economic Growth and Societal benefits

AI is rapidly transforming how services are delivered, decisions are made, and economies grow. In healthcare, agriculture, and other key sectors, AI is driving better outcomes through earlier diagnoses, smarter resource use, and data-informed solutions.

The International Monetary Fund (IMF) estimates that AI could raise global output by 0.5% annually between 2025 and 2030.[2] This growth could translate into higher incomes and new job opportunities in emerging and technology-enabled sectors, improved public and private services for consumers and citizens, and increased resources for governments and businesses to direct toward innovation, infrastructure, and workforce development.

These benefits offer notable potential for low- and middle-income countries, where AI-enabled tools across government, education, health, finance, and environmental management can expand access and strengthen resilience. But unlocking this potential requires reliable, secure, and affordable digital infrastructure. Universal broadband is essential to close existing divides and ensure fair access to AI-driven opportunities.

As AI models become more powerful, they require resilient, secure, and scalable infrastructure. Without investment in this foundational layer, the benefits of AI will remain out of reach for many. Just as connectivity powers AI, AI is increasingly used to manage and secure network infrastructure, optimizing traffic flow, predicting outages, and enhancing cyber resilience.

While innovation is surging, governance frameworks and infrastructure investments are still catching up. Without deliberate action, the digital divide may deepen as AI adoption accelerates. Multi-stakeholder collaboration – through government, the private sector, civil society, and multilateral organizations – can help build more efficient systems and expand access to digital tools, turning this challenge into an opportunity for widespread growth.

1 Connectivity Infrastructure Matters in Unlocking AI's Potential

To fully realize AI's transformative potential, global efforts must prioritize the expansion of digital infrastructure and the bridging of persistent connectivity and workforce divides. AI's lifeblood is data, and its storage, transmission, processing, and analysis across time and space rely on both hyperscale computing elements (e.g., data centers) and robust networking infrastructure. This network infrastructure encompasses several physical components, from subsea cables to Internet Exchange Points (IXPs), and some of these elements play even greater roles in enabling AI-based applications. Accelerating digital development will require a whole-of-society approach, where governments, the private sector, international organizations and civil society organizations share responsibility in driving these investments and crafting effective policies, enlarging economic benefits and mitigating digital and AI divides in the 21st century.

This chapter outlines the importance of digital infrastructure for wide-spread adoption and optimized performance of AI applications and systems, and recommends key investments and policies needed across stakeholders to ensure the availability and access of necessary infrastructure.

1.1 Global Connectivity

1.1.1 Connectivity Infrastructure Overview

According to the ITU's Global Connectivity Report, more than 2.7 billion people remain offline, and nearly 60% of users in low-income countries report affordability as the primary barrier to connectivity.[3] This underscores the need for public and private sector support for both modernizing infrastructure and establishing new ones. The benefits of modernizing outdated network equipment by phasing out and eventually replacing it with high-performing connectivity infrastructure are multifold: it increases digital access, enhances network security, and promotes efficient energy consumption.

Digital infrastructure can be mapped from the Internet's backbone to users across three major sections: first mile, middle mile, and last mile. Connectivity begins in the first mile, where subsea fiberoptic cables facilitate the bulk of long-haul data transmission, increasingly complemented by wireless satellite communication networks in low earth orbit (LEO).[4]

Figure 1: How the Internet Reaches You

Middle mile connections comprise most communications infrastructure, as data transmits across less robust fiberoptic and wireless components to connect local Internet Service Providers (ISPs) via IXPs. To provide a reasonably comparable level of service for rural communities, governments generally invest in middle mile networks when seeking to increase broadband access.

Finally, local ISPs deliver connectivity to their customers through fixed or mobile last mile connections. Last-mile connectivity remains a critical component of global broadband infrastructure, especially as efforts intensify to close the digital divide. Among available technologies, fiber-optic infrastructure continues to provide the fastest and most reliable last-mile connectivity, offering high-capacity, low-latency service ideal for both residential and enterprise users.

This is extensively supported by the work of ITU-T Study Group 15, which develops international standards for transport and access networks, including passive optical networks (PON), G.fast for copper/fiber convergence, and Radio-over-Fiber (RoF) systems (e.g., ITU-T G.9803), ensuring robust and scalable deployment of fiber-based broadband.[5]

However, in regions where fiber deployment is economically or logistically challenging, wireless technologies serve as important alternatives. Mobile broadband and geostationary or low-earth orbit satellite systems offer flexible, wide-reaching solutions for extending connectivity to rural or geographically isolated communities. These modes of access are addressed by ITU-T Study Group 13, which focuses on future network evolution, including fixed, mobile, and satellite convergence under the IMT-2020 framework and beyond.[6] Recommendations such as Y.3201[7] explicitly define architectural and functional requirements for the seamless integration of satellite and mobile broadband in next-generation networks. Together, the standards and frameworks developed by SG13 and SG15 support a hybrid approach to last-mile connectivity, combining the performance of fiber with the reach of wireless technologies to ensure equitable and sustainable access to the Internet worldwide.[8]

Regardless of the underlying technology – fiber, satellite, or mobile broadband – connectivity is ultimately delivered to end users through wired or wireless access technologies. In most settings, especially in developed countries, most internet traffic is transmitted over Wi-Fi, even when it is caried by mobile operators. In lower-income regions or mobile contexts, cellular networks often serve as the primary means of delivering internet traffic, particularly in outdoor or transit environments.

AI relies on strong, modern digital infrastructure; optimizing each segment of connectivity is essential to enabling widespread, effective AI use and demands coordinated investment and policy action.

1.1.2 Unique Requirements for Artificial Intelligence

AI's reliance on large amounts of data requires significant investment in both computing and connectivity. However, many parts of the world may still feel less prepared for these upgraded requirements: Cisco's 2024 AI Readiness Index indicated that more than half (54%) of global companies acknowledged their infrastructure "has limited or moderate scalability and flexibility to accommodate" the increasing needs of AI, while 78% lacked confidence "in the availability of computing resources for AI workloads"[9]. Maximizing AI adoption will depend on three key network characteristics: bandwidth, latency, and stability of network access. Even with recent advancements in connectivity optimization, cloud-based AI applications require bandwidths upwards of 10-100 Gbps, while complex AI tools like generative models and computer vision require 100-800 Gbps or more.[10]

These high data bandwidth requirements allow AI workloads to access, transmit, and process massive datasets between Internet of Things (IoT) devices and specialized AI servers used for data processing. Real-time AI applications, such as fintech, smart grid and smart healthcare, require low latencies (near-instant response time) in data transmission, as even milliseconds of delay could impact decision-making and safety. Equally important, successful AI usage requires stable networks, guaranteeing uninterrupted operations and preventing service disruptions that could erode trust in AI-driven solutions.[11]

Successful use of AI-powered technologies will depend on reliable, redundant communication networks for real-time data transmission, and the outcomes of AI integration hinge on the speed and volume in which data can be accessed, processed, and acted upon. This network performance requires delivery of services across different infrastructures (e.g., 5G, Wi-Fi, fiber and fixed wireless, satellites) and among disparate systems and devices in the data center, cloud, and edge.

While AI is often associated with cloud-dependent models like LLMs, additional AI tools running on edge devices – such as handheld diagnostic kits in rural clinics or smartphone-based soil sensors in agriculture – are transforming services in areas with limited infrastructure. These systems use onboard machine learning models that function offline and sync when network access is available, thereby enabling broader inclusion in underserved rural or low-income regions.

As AI systems proliferate across everyday life, robust network infrastructure providing low latency and network availability for high bandwidths will ensure widespread adoption and effectiveness.

1.2 Digital Infrastructure and Necessary Improvements

1.2.1 Subsea Cable Networks

The network of transoceanic data transmission has expanded to cover the globe with 570 in-service systems[12] through over 1,450,000 km of cables.[13] Formerly servicing mostly long-haul Internet usage, these networks are now dominated by demand from cloud providers, and data processing requirements fuel an increasing portion used by AI applications.[14] AI data usage will certainly increase capacity demand in these first-mile networks, however government-imposed data sovereignty requirements[15] and localized data processing could ultimately limit significant increases in capacity requirements.[16]

To ensure uninterrupted data flow, physical hardening against disruptions like undersea earthquakes, human interference, or cable dragging is essential. Redundant networks should provide transmission capacity for AI companies to prevent interruptions from cable failures or over-tasking. Additionally, robust cybersecurity protections are crucial to safeguard data privacy and integrity. Above all, to avoid limiting the benefits of AI applications, submarine cable networks must be resilient, redundant, and secure.

1.2.2 Terrestrial Fiber

Fixed fiber comprises the bulk of data transmission connected to subsea cables, with public and private enterprises collaborating to connect communities to the Internet. Yet despite years of targeted investment, fiber coverage with speeds necessary for AI lags considerably, including in developed economies. In the United States, just 51% of households have access to cable or fiber connections capable of 1,000 Mbps download speeds and 100 Mbps upload speeds that are necessary for advanced AI systems.[17] Certainly, not all homes may require such performance yet, however future AI applications may require that expanded coverage for scaled benefits.

Cost continues to limit universal fiber coverage, as laying new cables can cost between USD 60,000-80,000 per mile.[18] In the pursuit of universal access to AI benefits, however, governments can work to incentivize such projects with financial and regulatory support until viable alternative networks can attain sufficient speed and capacity to support AI data requirements.

1.2.3 Mobile Networks

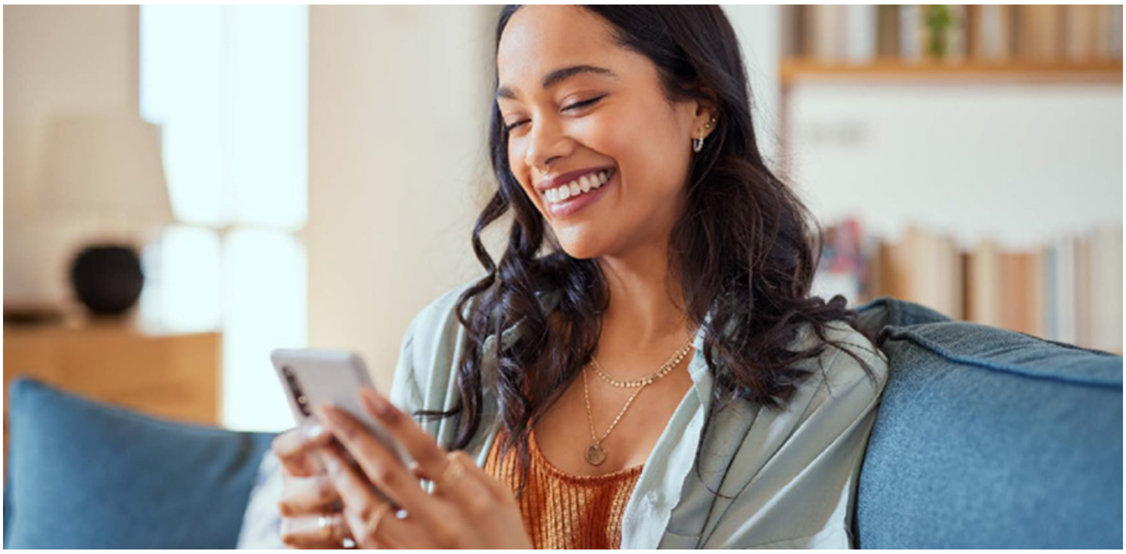
Mobile phones provide the most common gateway to the Internet in many countries, with over 80% of the global population[19] over the age of ten owning a personal device and over 92% of the world's population reached with at least 4G service.[20] And licensed fixed wireless service for homes and businesses is rapidly growing, particularly in Western Europe and North America, with more than 330 million fixed wireless access (FWA) connections expected globally by 2029.[21]

Still, the ITU's 2024 Facts and Figures brief further reveals that although 4G mobile coverage reaches over 90% of the global population, only 55% of people in low-income countries actually use mobile Internet due to cost, digital literacy, and device limitations.[22] While 3G remains a reliable option for Internet access to much of the world, it lacks the speed and capacity necessary to employ many AI applications.

Time and cost remain the biggest barriers to rural cellular coverage development, as single microwave towers (tower using high-frequency radio waves) can cost USD 100,000-250,000.[23] As with fixed fiber, networks of these transmission sites fail to provide attractive returns on investment for telecoms companies, leaving rural neighborhoods disconnected.

1.2.4 Wi-Fi and other Unlicensed Networks

Regardless of the underlying connectivity to the premises, Wi-Fi will almost certainly carry that traffic within the building. Wi-Fi is not only the dominant form of indoor wireless connectivity but also carries most of the traffic originating on mobile networks in many countries. The latest Wi-Fi standards, enabled by large channel sizes, provide high throughputs and low latency needed to support applications that require cloud-based AI for enhanced processing and storage. For example, Wi-Fi plays a key role in integrating AI with sensor networks, enhancing capabilities like home healthcare through efficient data transmission and processing.[24]



One of the major challenges facing unlicensed operations, however, is the lack of spectrum. As the number of connected devices in homes and businesses has exploded, existing spectrum in the 2.4 and 5 GHz bands has become congested in many countries, affecting performance. While some countries have made as much as 1200 megahertz of new spectrum in the 6 GHz band available, many other countries, particularly in Europe and the developing world, have split the 6 GHz band between unlicensed and mobile use or deferred a decision till 2027 or beyond. Such countries may face limits on their ability to realize the full benefits of AI over the next 10 years compared to their counterparts. In addition, because of related regulatory approval delays, 6 GHz-capable equipment may be costly or not widely available in many developing countries.

1.2.5 Satellite Networks

Last-mile satellite connectivity can help address the rural connectivity challenge. With increasing public and private investment in non-terrestrial communications networks, satellites play a growing role in enabling digital connectivity worldwide. Based on current trends, the number of people connected to the Internet via satellite is projected to reach 500 million by 2030, with associated economic benefits growing to over USD 250 billion by the end of the decade.[25]

Still, power requirements, meteorological impacts, and spectrum deconfliction measures (such as frequency coordination and power control) limit the capacity and reliability of satellite-based communications. Such systems offer sufficient capabilities for lower-demand digital communication methods, but they remain limited relative to other long-haul networks like subsea cables.

However, satellite communications can still play a role in advancing AI adoption through last-mile connectivity to remote regions.[26] Unlike terrestrial fiber and microwave towers, stable and redundant satellite relays can connect edge users with IXPs or data processing centers, enabling underserved regions to access the benefits of AI applications at an affordable cost.

Internet Exchange Points

Internet Exchange Points (IXPs) play critical roles in ensuring uninterrupted data transfers as traffic passes between local networks. IXPs connect independent telecommunications systems with peering data sharing agreements, allowing companies to reduce latency by utilizing competitor-owned infrastructure. Investment in IXPs outside of data centers now offer lower-cost options for underserved markets, enabling affordable local data transfer, rather than travelling vast distances to reach large data centers.

Governments are crucial to the success of IXPs, which thrive when connecting local networks to the Internet's core. By promoting competition and creating favorable investment conditions with stable regulations and reliable energy sources, countries can attract innovative market participants to build the necessary peering networks.[27]

IXPs are critical to build strong, accessible infrastructure, especially in underserved markets, to support widespread AI adoption.

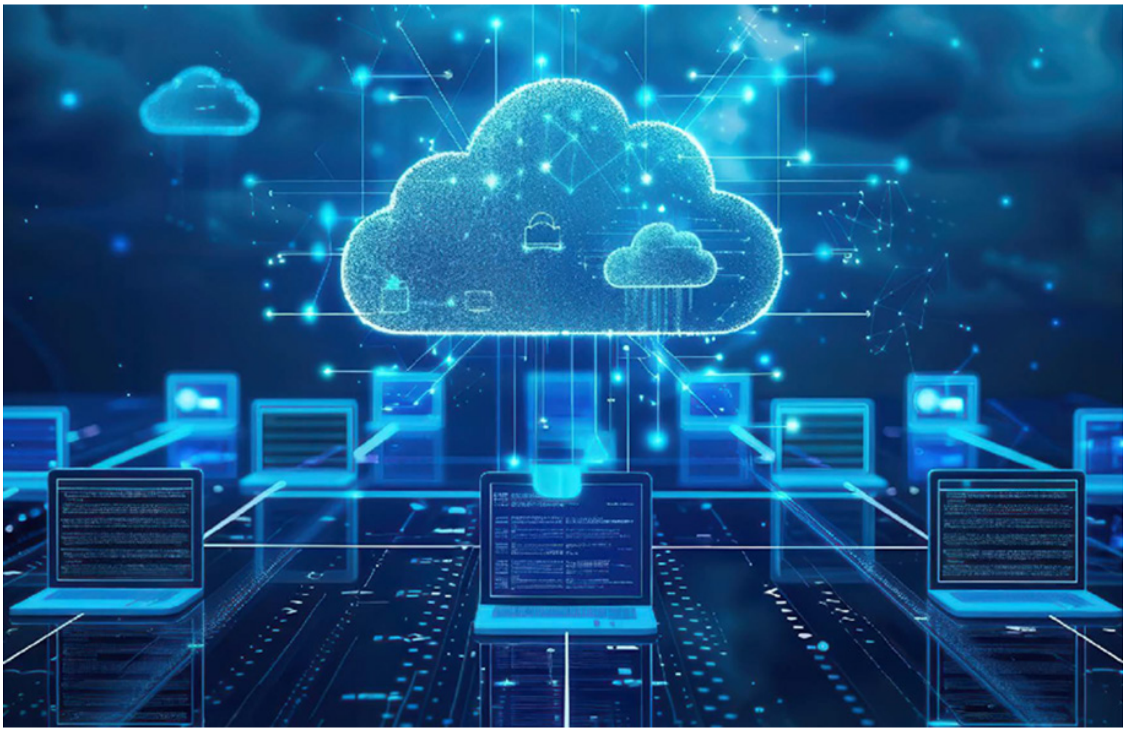
1.2.6 Cloud Services & Data Centers

Cloud servers and their associated software and data offer efficiencies and scaling power. These virtualized computing systems operating at large data centers offer lower cost and more reliable data storage, processing, and exchange to multiple companies on a single server. The outsized benefits of cloud computing contribute significantly to the acceleration of AI development. Computational power, depth and data diversity has been used for model training, data analysis, and application employment across a variety of fields, from healthcare to financial services.[28]

Without access to cloud servers, organizations in these underdeveloped markets face higher costs of energy and server operations while lacking access to the technical benefits of scaled computing. Rectifying this divide requires both increased private sector investment in server sites and accompanying government investment and policy support to cultivate infrastructure environments friendly to access cloud-based computing.[29]

Data centers now play critical roles in digital networks, supporting AI applications that require greater computing support like Natural Language Processing (NLP) or computer vision. McKinsey estimates demand for data centers to grow at an average rate of 33% per year until 2030, far outstripping construction and integration efforts underway.[30]

Several critical bottlenecks hinder the construction of data centers from meeting current and projected data processing demands. First, new sites typically require new energy sources, as the high energy demands at a single location could place pressure on existing energy grids with possible negative effects on local communities.[31] Second, permit acquisition processes for new data center sites slow construction and burden companies with regulatory requirements. While governments have begun taking encouraging steps to expand power generation, promote clean energy at data center sites, and simplify permitting for new projects, these efforts must be accelerated to support the rapid scaling and performance demands of modern data centers.[32]



1.2.7 Edge Computing and IoT Integration

As processing capacity and speed requirements grow, performing AI computing at consolidated data centers and in the cloud becomes increasingly inefficient or impractical. Rather than accepting transmission delays for these critical tasks, computing at the edge can reduce latency by allowing data processing and analysis much closer to the data source, reducing transmission distance and time required for data transfer. Devices such as smartphones and IoT smart sensors can also be useful mid-points in this data transmission process. They enable both upstream applications that filter prioritized data to centralized servers, and downstream applications that perform real-time processing at the source.

Gartner predicts that 75% of data generated by companies will be created and processed outside traditional data centers or cloud environments by 2025 as the computing power of smaller devices continues to grow.[33] This expanded market for edge computation promises to offer proportionally greater impact to under-resourced markets and rural communities, where lower investment returns on large data centers may hinder construction. By limiting data processing at the source rather than consolidating it in data lakes, edge devices can reduce the investment costs of traditional data infrastructure. The shortened journey of data processing also has security benefits: it minimizes the risks of transmitting sensitive information, such as personal health records or financial transactions, over long distances.[34] However, it also underscores the importance of securing dispersed edge computing devices and network endpoints, which can become vulnerable entry points if not properly protected.

Still, powerful miniature computing elements will likely start at high price points, so private sector development efforts should balance affordability with capability in AI-enabled edge devices to improve access for a range of consumers rather than maximizing pure computing power.

1.2.8 Reconfiguring Network Architecture

Modernizing network architecture prepared for an AI economy can start with the reconfiguration of existing network designs. The current cloud environment is often costly, involving purchasing many routes and ports connected to different locations just to achieve the interconnectivity between carrier-neutral data centers and multiple hyperscalers. This operation inevitably drives up the costs and increases network latency. Some global communication and Internet service providers have begun moving away from this classical design by upgrading their equipment and creating a direct path to multiple data centers and clouds with a single network, saving close to 60% of costs with a modern network architecture delivering higher speeds.[35]

1.2.9 Digital Public Infrastructure

Another foundational element for AI's success is the development of strong digital public infrastructure (DPI), which ensures reliable connectivity and secure and efficient data exchanges. In addition to the physical components, elements like digital identities play an increasing role in advancing connectivity. DPI encompasses the digitalization of public and private services on a common infrastructure, from government functions to personal finance. While physical components comprise most networking infrastructure, application speed and performance also rely heavily on software. In an increasingly interconnected society dependent on the Internet, DPI facilitates individual online user needs for identification/ authentication, payments, and data exchanges.[36]

Cisco's Investment in Singapore's Public Safety Technologies[37]

In 2024, Cisco signed a Memorandum of Understanding (MoU) with the Home Team Science and Technology Agency (HTX) of Singapore to pilot next-generation technologies that enhance homeland security operations. The partnership supports Singapore's broader Smart Nation and digital security goals by testing and deploying 5G, edge computing, and AI solutions across key public safety scenarios. The public-private partnership is grounded in Cisco's Country Digital Acceleration (CDA) program and focuses on three areas:

1. **Next-Generation Incident Response**: Leveraging 5G and edge AI to enable real-time decision-making in emergency environments, including through rapid data analysis and remote support.
2. **Enhanced Mobile Operations**: Exploring mobile 5G connectivity to support HTX field teams with high-speed, secure communications.
3. **Smart Facilities Management**: Piloting AI and IoT-powered infrastructure for predictive maintenance and real-time operational awareness in homeland security facilities.

Governments bear the primary responsibility for crafting and implementing effective DPI, whose success hinges on both technical and policy design. Leveraging private sector experience, governments should employ software that is secure, interoperable, open, and accessible. Simultaneously, policymakers should build trust with potential users by employing clear public oversight mechanisms while providing sufficient data and privacy protections. Concerns of government overreach have handicapped some DPI efforts, and effective DPI cases like that in Estonia are those built upon transparency and privacy.[38]

Estonia's Digital Public Infrastructure[39]

Estonia has become a global leader in digital public infrastructure by combining secure digital identity, robust cybersecurity, and streamlined digital governance. Many of its public service innovations are powered by AI, developed through close collaboration between the government, local technology companies, and research institutions. These AI-driven solutions are actively applied across sectors such as healthcare, transportation, and public administration.

Its national ID system enables secure access to services like i-Voting, banking, and health-care, while the "Cyber-Conscious Estonia" strategy strengthens national resilience against cyber threats. Estonia's government cloud ensures continuity of public services, and its digital healthcare initiatives, including e-prescriptions and electronic vaccination certifi-cates, have enhanced both everyday care and crisis response. Through these integrated efforts, Estonia has created a resilient, efficient, and citizen-centric digital society that serves as a model for digital transformation worldwide.

1.3 Connectivity Infrastructure to Achieve United Nations Sustainable Development Goals

The true promise of connectivity infrastructure as an enabler of AI goes beyond scaling the number of AI applications and users around the world. Instead, such infrastructure serves to realize the broader goals for the collective humanity. The Sustainable Development Goals (SDGs) set by the United Nations in 2015 were a universal call to action to eliminate poverty and ensure all people enjoy physical well-being and economic prosperity. Increased digital connectivity that drives AI deployment and development can drastically elevate living standards, thus accelerating successful achievements of multiple SDGs.

These six SDGs below showcase the transformative potential of combining digital infrastructure with AI innovation.

Digital Connectivity and Progress of the Sustainable Development Goals (SDGs)	
	SDG 1 – No Poverty: The proliferation of information and communication tech-nologies has demonstrated abilities to enhance economic growth and reduce poverty.[40]
	SDG 3 – Good Health and Well-being: Greater digital connectivity has revo-lutionized the healthcare sector by improving patient care, diagnosis and treatments.[41]
	SDG 4 – Quality Education: Countries with greater levels of digital connectivity in schools generally enjoy higher performance levels on standardized tests.[42]
	SDG 9 – Industry, Innovation, and Infrastructure: Improved transparency and trust enabled through network connectivity accelerates innovation and value creation in digital native fields and traditional sectors like manufacturing.[43]

(continued)

Digital Connectivity and Progress of the Sustainable Development Goals (SDGs)	
10 REDUCED INEQUALITIES	**SDG 10 – Reduced Inequalities**: Network infrastructure development has demonstrated ability to reduce urban-rural income inequality, particularly by improving financial inclusion for underserved populations.[44]
17 PARTNERSHIPS FOR THE GOALS	**SDG 17 – Partnership for the Goals**: Public-private AI partnerships expand global digital connectivity and strengthen digital public infrastructure.[45]

With the right infrastructure and policies, AI and digital connectivity can unlock new opportunities across sectors. Smarter networks can expand access to education, enhance healthcare systems, improve public services, create new jobs and lifelong opportunities. As AI becomes more integrated into daily life, strong digital foundations will be essential. Governments, industry, and communities each have a role to play in building systems that are fair, resilient, and ready for the future.

2 The Role of AI in Connectivity

The symbiotic relationship between AI and connectivity represents a transformative shift in how network infrastructure is managed, optimized, and secured – forming the backbone of the digital transformation era. As digital ecosystems expand, the demand for resilient, efficient, and secure networks grows exponentially. AI's ability to analyze vast datasets, predict patterns, and automate processes makes it indispensable for high-performance network operations. Furthermore, AI and ML are redefining network and spectrum management by enabling real-time optimization of network resources through more natural, accessible interfaces. This evolution helps lower the technical barrier to entry, allowing a broader range of professionals to manage complex networks and helping address labor shortages in high-demand areas like cybersecurity. In contrast, traditional network operations depend on static configurations and manual adjustments, making them inefficient in handling fluctuations in traffic, bandwidth demand, and security threats.

This chapter explores how AI enhances connectivity through advanced network management, energy-efficient operations, and proactive security frameworks, with a focus on bridging the digital divide in developing economies. Drawing on insights from industry leaders like Cisco and IBM and empirical studies, we analyze the technical, economic, and societal implications of AI-integrated networks.

2.1 AI in Network and Spectrum Management

2.1.1 Real-Time Network Optimization

Traditional network management methods often rely on manual intervention and reactive troubleshooting, which are insufficient in the face of growing data volumes and complexity. AI-driven solutions modernize this process by enabling real-time optimization of network resources. For instance, with Splunk, Cisco leverages AI to process vast amounts of network data, detecting anomalies and predicting failures before they occur, thereby reducing downtime and preventing costly outages.[46]

Similarly, IBM is integrating its AI and generative AI products to diagnose and resolve network infrastructure issues and provide location-based insights. These capabilities help reduce latency and support seamless connectivity for data-heavy applications. Generative AI adds further value by simulating network traffic to anticipate future demand, dynamically adjusting routing paths and allocating bandwidth based on both historical trends and real-time conditions.

Equally, the approach can be a key economic driver for developing countries, who are increasingly redirecting their focus to the services sector. Manufacturing used to be the surest way for low-and middle-income economies to reduce poverty and create jobs. In the past three decades, the services sector has grown faster than manufacturing in many developing economies. According to UN Trade and Development (UNCTAD), over the past 30 years, the share of services has grown to account for 55% of gross domestic product (GDP) and 45% of employment in developing economies.[47] Innovative network management methods that enable real-time optimization can improve business processes, enable innovation, create new markets, and support the growth of national economies.

Scenario Box:
How Real-Time Network Optimization Reshapes the Services Sector

Scenario: Consider a mid-sized financial services company operating in a developing economy, managing multiple branch offices, ATMs, and digital banking platforms. With limited IT staff and constrained infrastructure budgets, the company frequently encounters issues such as inconsistent network performance, misconfigurations affecting secure transaction systems, and connectivity disruptions impacting critical services.

AI-Driven Solution: To address these challenges, the company deploys Cisco's AI-driven automation platforms (such as Meraki,[48] Intersight,[49] and Catalyst),[50] which leverage real-time telemetry, predictive analytics, and contextual awareness to simplify network management at scale. The platforms empower the organization to:

- **Continuously monitor and analyze network behavior**, using AI to predict and prevent performance degradation before it impacts digital services.
- **Automate configuration changes and policy enforcement**, reducing the likelihood of human error in security-sensitive financial environments.
- **Enable intent-based networking**, aligning network behavior with business outcomes such as secure digital transactions and prioritized service delivery.
- **Provide contextual insights and guided remediation**, allowing IT teams to rapidly understand and resolve network anomalies without deep technical expertise.

Outcome: The financial institution achieves **a more resilient, secure, and high-performing** network infrastructure. AI-driven automation significantly reduces manual effort, enabling the lean IT team to shift focus from reactive troubleshooting to strategic initiatives like customer experience improvement and regulatory compliance. This enhances operational continuity and supports broader goals of financial accessibility and digital trust.

2.1.2 Spectrum Efficiency

Efficient spectrum management is critical for ensuring high-quality connectivity in regions with limited resources. AI-powered spectrum management solutions allocate and adapt frequency usage in real time by continuously analyzing network conditions.[51] These AI-driven adjustments enable networks to support a higher density of users and devices without compromising performance.

In developing nations where infrastructure is limited, such innovations are particularly impactful. For example, AI-driven spectrum management can help rural areas maximize the utility of available frequencies, providing reliable Internet access to underserved communities. Additionally, AI-powered beamforming techniques optimize multiple-input, multiple-output (MIMO) systems, enhancing signal quality and boosting data throughput in high-density network environments. AI helps direct signals more effectively, allowing more people to use the network simultaneously without slowing down the connection.

These AI-driven connectivity solutions are only as effective as the regulatory and technical frameworks that support them. The ITU-R (International Telecommunication Union Radiocommunication Sector) is a branch of the ITU responsible for managing the global radio-frequency spectrum and satellite orbits, as well as developing international standards for wireless communications, including 5G, unlicensed, satellite, and broadcasting services. ITU-R plays a key role essential for AI-capable networks. Its work on unlicensed and IMT spectrum bands enables equitable access and fosters innovation in satellite-enabled AI for low-resource settings. Standards like ITU-R M.2083-0 provide long-term guidance for intelligent mobile systems, aligning national strategies with global best practices.[52]

Furthermore, research indicates that AI-driven spectrum allocation can significantly enhance spectrum utilization:

- A study published in the *European Journal of Science, Innovation and Technology* demonstrated that an AI-based dynamic spectrum allocation model achieved 88% efficiency in managing available spectrum, surpassing traditional static allocation methods.[53]
- A report by the *Smith Institute* highlights AI's potential to revolutionize spectrum management by optimizing resource usage and reducing interference.[54]

While specific figures may vary across studies, these findings collectively underscore AI'' capacity to substantially improve spectrum utilization and network efficiency.

2.1.3 AI Connectivity in the Last Mile

As generative AI applications become more sophisticated and bandwidth-intensive, capable of producing 4K, 8K, and even 12K video content in real time, the importance of high-performance connectivity at the network edge has grown exponentially. This evolution marks a shift in how service providers must approach the last mile of connectivity: the final segment of the network that delivers services to end users. Once a persistent bottleneck in digital infrastructure, the last mile is now a focal point for innovation, with AI emerging as a transformative force in bridging performance, scalability, and user experience.

New generative AI models like OpenAI's GPT-4o and Sora, Cohere's Command, and Mistral's Large empower users to generate complex, data-rich content on-demand – raising the stakes for latency, throughput, and compute proximity. The challenge lies in meeting these performance expectations without overburdening core networks or centralized data centers. This has led to a growing need for AI-assisted edge computing, where service providers move compute and storage resources closer to the end user to reduce latency and improve responsiveness. AI helps optimize last-mile connectivity by:

- Predicting user behavior and pre-positioning data at local nodes using edge analytics, reducing the need to route every request back to centralized servers.
- Dynamically allocating local resources including processing power and bandwidth based on real-time demand, improving the efficiency of high-resolution content delivery.[55]
- Proactively managing congestion and signal interference in last-mile access points (e.g., fiber-to-the-home, 5G base stations, or community mesh networks), thereby ensuring consistent quality of service (QoS) for applications like live AI video synthesis and interactive virtual experiences.

Moreover, AI helps balance backhaul and last-mile coordination, ensuring that the entire data path from centralized cloud infrastructure to the user endpoint operates as a unified, intelligent system. Advanced traffic classification algorithms and intent-based orchestration enable networks to understand application needs (e.g., low-latency video rendering vs. bulk data uploads) and adjust routing and caching policies accordingly.

This capability is not just a technical upgrade, it is an economic enabler. In developing regions, last-mile AI connectivity can help leapfrog legacy infrastructure challenges by intelligently maximizing the performance of limited broadband or wireless deployments. For instance, AI-enhanced last-mile solutions can:

- Extend the reach of broadband in underserved rural areas through optimized wireless mesh networks and low-cost edge nodes. A study by the World Bank found that increasing mobile broadband penetration by just 10% in developing regions can raise GDP growth by up to 1.4%, a gain magnified when such growth is paired with AI-driven content and service delivery.
- Facilitate digital entrepreneurship by enabling creators in remote areas to participate in the global AI economy, producing and selling high-resolution AI-generated content.
- Support e-government and digital health initiatives, where real-time video and secure data exchange are essential for service delivery.

AI-managed end user networks are another critical component to last-mile connectivity. Advanced Wi-Fi networks now allow users to use generative AI user interfaces to automate network spectrum utilization as well as automatically identify and apply policies to every connected device on the network.[56] These systems also allow for the tracking of equipment in real time, the provision of automatic updates to customers or employees, and seamless directions for end users to available meeting rooms or desks.

In short, AI-driven last-mile connectivity is foundational to the next phase of digital economy growth. It ensures that the benefits of generative AI and other advanced services are not limited to urban centers or high-income users, but are accessible to diverse populations globally, unlocking new economic opportunities and supporting accessible innovation.

2.2 AI-Driven Energy Efficiency

Despite major advancements in digital infrastructure, energy waste remains a significant challenge. According to the International Energy Agency (IEA), improved efficiency measures could save up to 3.5 gigatons of CO_2 emissions annually – the equivalent of removing approximately 750,000 cars from the road, based on average U.S. vehicle emissions.[57]

While AI models demand computational power, they also offer tools to make digital networks more energy-efficient. AI enables real-time monitoring and control of network components, allowing systems to dynamically adjust energy usage based on demand. For example, AI can automate the powering down of idle base stations during low-traffic periods or optimize bandwidth allocation to reduce unnecessary processing loads.[58]

A 2023 ITU report emphasizes that energy efficiency in AI-powered digital infrastructure is not only a cost-saving imperative, but also supports sustainability; for instance, the report notes that ICT has the potential to abate between 0.72 to 12,080 million tons of carbon dioxide equivalent (Mt C02e) annually.[59] Rather than simply contributing to rising energy use, AI can play a key role in enabling more efficient network infrastructure. In this way, digital transformation and environmental goals do not have to be in conflict. With the right tools and investments, they can strengthen each other.

Success Stories:
Leveraging AI to Drive Efficiency

AI-powered predictive maintenance can reduce maintenance costs by up to 30% and increase equipment uptime by 20%,[60] contributing to overall energy efficiency. Google's DeepMind AI, for instance, has successfully reduced cooling costs in data centers by 40% through intelligent predictive climate control mechanisms.[61] Additionally, AI algorithms such as those used in Cisco's StackPower adjust network component activity based on traffic demand. Deactivating idle components during off-peak hours can lead to significant energy savings in data centers. AI also facilitates the integration of clean energy sources into network operations. By forecasting energy demand and intelligently balancing power distribution, AI enables data centers to maximize their reliance on diverse sources of power.

Reports indicate that 74% of IBM's data center energy consumption in 2023 came from renewable sources, alongside a 16.4% improvement in cooling efficiency. These gains demonstrate measurable progress in grid flexibility and renewable energy use, underscoring the potential of AI to enable real-time, low-carbon energy management across digital infrastructure.[62]

2.3 AI-Driven Security: Safeguarding Data Integrity and Network Resilience

The security of communications networks is paramount to ensuring data integrity, privacy, and resilience against cyber threats. AI enhances cybersecurity by continuously monitoring network traffic, detecting anomalies, predicting threats, and automating responses to security incidents. Leveraging trusted networks and suppliers – particularly in sensitive AI use cases like healthcare – further strengthens defenses by ensuring the underlying systems are secure, reliable, and free from vulnerabilities.[63]

The integrity of data used in AI applications depends on secure networks that protect against cyber threats. AI strengthens endpoint security by detecting malware, ransomware and phishing before they compromise networks. Advanced AI-driven security solutions employ behavioral analysis to recognize suspicious activities and take pre-emptive action. Additionally, the ITU has stressed that safeguarding digital infrastructure must evolve in parallel with AI development. In its global policy guidance on AI, the organization calls for zero-trust models, data encryption, and privacy-by-design standards to protect AI training data and digital citizens alike.[64] As such, AI-powered zero-trust security frameworks ensure continuous verification of network access, reducing the likelihood of unauthorized intrusions.

At a global level, organizations and governments can also enhance their cybersecurity posture by deploying AI-enabled defenses as an interim safeguard for vulnerabilities when immediate patching or system replacement is not feasible. This is especially critical in regions where legacy infrastructure and limited technical capacity increase exposure to cyber threats. These advanced systems use real-time threat detection and adaptive learning to identify and mitigate potential exploits, providing a critical layer of protection.

By isolating affected systems, segmenting network traffic, and actively monitoring for suspicious activity, AI-enabled solutions minimize the risk of breaches while ensuring business continuity. As digital infrastructure becomes more central to economic and social development worldwide, deploying AI for proactive cyber defense is essential to ensure global digital resilience and trust.

Success Stories:
Proactive Threat Detection Strategies

Cisco's HyperShield is AI-native and designed to be autonomous and predictive security enforcement for AI scale data centers and clouds.[65] HyperShield also utilizes its AI-native rule engine to prioritize vulnerabilities and deploy precise mitigating controls that block exploits in real-time. During a recent Distributed Denial of Service (DDoS) attack on a bank, ThousandEyes rerouted traffic within seconds, preventing service disruption and mitigating financial losses.[66] AI-driven security frameworks also employ advanced encryption techniques to safeguard sensitive information against unauthorized access. For example, anomaly detection systems can identify phishing attempts with up to 99.5% accuracy by analyzing metadata and content patterns.[67] By integrating AI-driven deception technologies, networks can deploy honeypots to lure and analyze malicious actors, improving proactive threat detection strategies. HyperShield also utilizes its AI-native rule engine to prioritize vulnerabilities and deploy precise mitigating controls that block exploits in real-time.

Therefore, by leveraging real-time analytics and automation capabilities, AI enables smarter resource allocation, reduces environmental impact, and fortifies networks against cyber threats. These advancements enhance connectivity by making networks more reliable, efficient, and resilient – ensuring broader and more consistent access for users across diverse environments.

This progress reflects the transformative potential of combining digital infrastructure with AI innovation to advance key Sustainable Development Goals, including SDG 9 (Industry, Innovation and Infrastructure), SDG 10 (Reduced Inequalities), and SDG 13 (Climate Action).

The Role of AI in Advancing Connectivity and Achieving the SDGs	
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	**SDG 9** – Industry, Innovation, and Infrastructure: Optimizing networks in real-time with AI aligns with enhances infrastructure resilience, fosters technological innovation and creates new skills and job opportunities.[68]
10 REDUCED INEQUALITIES	**SDG 10** – Reduced Inequalities: Spectrum efficiency and investments in AI-enabling infrastructure can ensure the benefits of AI extend to underserved communities.[69]
13 CLIMATE ACTION	**SDG 13** – Climate Action: While AI consumes large amounts of energy, real-time optimization of networks can reduce energy consumption, supporting the goals of climate action by making networks more energy-efficient and reducing their environmental impact.[70]

3 Realizing Economic Benefits of AI Enabled Connectivity: Closing the Digital Divide

In an era where connectivity drives progress, LDCs find themselves at a crucial juncture. Despite significant advancements across various sectors, these regions continue to face a mutual and persistent challenge: the digital divide. The digital divide remains one of the most pressing challenges of the 21st century, with over 3.7 billion people globally lacking reliable Internet access.[71] Remote, rural, and underserved communities remain disconnected from the transformative potential of modern telecommunications and emerging technologies like AI, limiting socio-economic development and obstructing progress toward the SDGs.

At the core of this challenge lies the urgent need for increasing access to connectivity. As AI reforms industries, its potential to drive economic growth, enhance productivity, and address societal challenges hinges on access to resilient connectivity: high-speed Internet, digital infrastructure, and widespread access to AI technologies. Without these foundational elements, the digital divide threatens leaving developing nations further behind in the global economy. As such, access to AI is not merely a technological milestone, it is a critical enabler of economic growth, job creation, and societal well-being.

Chapter 3 highlights the growing urgency of addressing the digital divide, emphasizing how unequal access to connectivity deepens social and economic disparities. It explores digital infrastructure as a driver of inclusive growth and outlines initiatives from governments, industry, and international organizations. The chapter concludes with policy recommendations to guide collaborative efforts in closing the gap.

3.1 The Digital Divide: Why it matters

3.1.1 Risks of Inaction

A) Increased Connectivity Gap

Lack of connectivity results in a lack of access to AI capabilities, widening the economic and social disparities between connected and unconnected regions. When developing nations, especially those with rural and underserved communities, suffer from limited access to high-speed Internet, it hinders the level of education, healthcare, and economic opportunities.

This is particularly evident in education, where students in connected areas benefit from AI-powered learning platforms, while those in unconnected regions face severe disadvantages. It is thus unsurprising that a UNESCO report highlights that 89% of learners do not have access to household computers and 82% access to digital learning resources, putting them at a significant disadvantage compared to their peers in more connected regions.[72]

Therefore, improving connectivity and including more citizens in the digital economy is imperative for socioeconomic transformation. For example, rural Latin America faces low mobile Internet penetration rates despite its potential for agricultural innovation through AI tools, for example.[73] Digital agriculture tools that rely on mobile connectivity can help farmers improve productivity and adapt to changing weather patterns. However, as much as 80% of rural populations in some areas in Latin America and the Caribbean lack meaningful connectivity due to coverage gaps and affordability concerns.[74] Without addressing these issues, rural communities will remain excluded from the benefits of digital transformation.

These disparities are not merely technical issues; they perpetuate cycles of poverty and underdevelopment as communities remain disconnected from opportunities enabled by digital transformation.

B) Exacerbated Digital Divide

The lack of connectivity exacerbates existing inequalities both within countries (urban vs. rural) and between nations (Global North vs. Global South). High-income countries are leveraging AI for productivity gains across sectors such as healthcare, manufacturing, and agriculture. Meanwhile, developing economies face bottlenecks due to limited infrastructure, unaffordable devices, and insufficient digital skills.

This emerging “AI divide” risks turning temporary disparities into long-term barriers to prosperity. The lack of AI resources and data processing capabilities in developing nations creates challenges, reinforcing dependency and preventing developing countries from fully participating in the value chains of the digital economy. For example, high-income countries are increasingly adopting AI-driven technologies that optimize supply chains or improve healthcare outcomes. In contrast, less-developed regions struggle with basic connectivity issues that prevent even foundational digital services from reaching underserved populations. Despite these challenges, policymakers from around the world continue to engage in discussions about these issues with the hope of finding solutions that will benefit all stakeholders, and further reduce the AI divide. Deep engagement between governments to meaningfully address these disparities will provide the best outcomes for all.

C) Closing the Gap: Digital Infrastructure as a Catalyst for Growth

Targeted investments in technology-intensive sectors can reduce risk and raise incomes in low-resource settings. In sub-Saharan Africa, addressing connectivity barriers could unlock $170 billion in GDP by 2030.[75] By enabling access to education, e-commerce, and healthcare services, these efforts can transform underserved communities into active participants in the global economy. Similarly, in Latin America, agritech platforms leveraging IoT devices have already demonstrated their potential to reduce costs and increase yields for smallholder farmers.[76] Scaling such solutions requires not only infrastructure investment but also policies that promote AI accessibility, affordability, and literacy.

3.1.2 Addressing the Digital Divide

AI adoption in developing regions has the potential to significantly boost GDP and job creation. According to PwC, AI could contribute USD 15.7 trillion to the global economy by 2030.[77] A portion of this growth will stem from developing nations that successfully implement AI and improve connectivity:

- While AI automates some roles, it also creates new demand for AI specialists, data scientists, and cybersecurity professionals. The AI job market in India, for example, has seen a 42% increase in AI-related job openings over the last two years.[78]
- Studies have found that AI-driven automation in agriculture and manufacturing increases efficiency and lowers production costs.[79]
- In Rwanda, AI-enabled healthcare chatbots assist in diagnosing diseases and providing medical advice, reaching over 2 million people in remote areas where medical facilities are scarce.[80]
- Similarly, AI-powered disaster response systems in Indonesia have enhanced early warning capabilities, successfully detecting early signs before the arrival of stronger seismic waves and thus providing up to 75 seconds of warning time. This advance allowed for timely alerts and has the potential to reduced significant casualties.[81]
- AI is also driving multiplying financial successes by enabling microloans for small businesses. In parts of Southeast Asia, AI-driven financial services have helped boost revenues – surging by 35% between 2022 and 2024, reaching US$22 billion and accounting for 65% of all digital financial services (DFS) revenue in the region.[82]

3.1.3 Workforce and Digital Skills Development

Leveraging AI's benefits requires more than connectivity access. Scaling AI also requires a skilled workforce adept at creating, managing, and collaborating with novel applications. The rapid proliferation of AI has upended the structure and operation of workplaces in economies around the world, with about 60% of jobs in advanced economies exposed to AI.[83] While that number falls to 40% in emerging markets and 26% in low-income economies, these groups are more vulnerable to exacerbated digital divides if not upskilled or reskilled to harness the technology. These populations broadly have lower digital literacy rates and fewer opportunities to build skills necessary to leverage AI applications in their work.[84]

An AI-ready workforce could span several categories. First, professionals may reorient their work toward AI-related jobs by managing data, providing technical input, offering technical support, developing new products, or scaling organizational adoption.[85] Second, increased skilled, human-oriented talent may be necessary for AI-adjacent jobs such as healthcare, manufacturing and STEM-related fields.[86] Finally, roles related directly to physical connectivity elements, such as data center construction and network infrastructure engineering, may see growth as digital connectivity becomes even more important. Developing countries will need to integrate digital skills across their education systems to cultivate talent capable of creating, managing, and scaling AI, while simultaneously ensuring the existing workforce develops non-technical skills essential for human-to-AI or human-to-human collaboration. According to ITU's Facts and Figures report, fewer than one in four individuals in LDCs possess basic digital skills – signaling a major barrier to AI readiness and broad participation in the global digital economy.[87]

3.1.4 Ongoing Efforts to Expand Digital Access

Efforts to close the digital divide have gained momentum through collaborations between governments, private companies, and international organizations. These initiatives aim to expand connectivity, improve digital literacy, and create positive digital ecosystems. Below are a few of these key initiatives:

A) The World Bank's Global Digital Initiatives

The World Bank Group has launched several programs to accelerate digital access worldwide. Through its Accelerating Digitalization Global Challenge Program, the World Bank is helping countries adopt digital solutions more rapidly while strengthening digital public infrastructure. Key components include digital IDs, payment systems, and data-sharing platforms that connect people to essential services like jobs, banking, healthcare, and education. The program also fosters innovation by sharing solutions across borders and building integrated digital markets. For example, the initiative aims to connect 300 million more women to broadband by 2030, with funding support from the Gates Foundation.[88]

B) Giga Initiative – UNICEF and ITU

The Giga initiative by UNICEF and ITU focuses on connecting schools to the Internet in underserved regions. To date, it has connected 5,500 schools across Africa, Latin America, and South Asia, benefiting over 2.1 million students.[89] By prioritizing education infrastructure, Giga ensures that young learners gain access to digital resources essential for participating in an AI-driven economy.

C) AI for Good

The ITU's AI for Good platform plays a key role in accelerating scalable AI solutions for health, education, sustainability, and especially edge AI applications in fragile or underserved environments. Notably, the *Digital Agriculture: A Standards Snapshot* report, produced by the ITU/FAO Focus Group on AI and IoT for Digital Agriculture (FG AI4A), lays a foundation for harmonized technical terminology, data-model frameworks, and ethical best practices to support localized, AI-driven agricultural interventions.[90] Complementing this, the AI Skills Coalition, launched under the AI for Good Impact Initiative, addresses the global AI skills gap by mobilizing a UN-led educational ecosystem, including global challenges, digital transformation hubs, and capacity building centers. The Coalition emphasizes inclusive training – especially for women, youth, and individuals in Least Developed Countries, with a target of equipping 10,000 learners with essential AI capabilities by the end of 2025.[91]

D) Amazon Partnerships with Local Operators

In an industry-first collaboration, Amazon has partnered with telecom operators such as Vodafone in Europe and Africa,[92] and Vrio (including DIRECTV Latin America and Sky Brasil) across seven South American countries.[93] These collaborations enable satellites to link rural cellular towers to core networks, extending 4G/5G services. For instance, Vrio will provide Kuiper-powered broadband to approximately 383 million people, of whom an estimated 200 million currently lack connectivity.

E) Cisco's Contributions

Cisco has played a pivotal role in bridging the digital divide through targeted interventions in connectivity expansion and workforce development.

Access to AI and high-speed connectivity is not just a technological advantage, it is an economic necessity. The impact of these technologies extends far beyond convenience; they are powerful enablers of growth. High-speed connectivity and AI integration fuel productivity gains across key sectors: from agriculture, where smart tools improve yields, to healthcare, where telemedicine brings critical services to remote populations. These technologies are also generating entirely new employment categories and businesses, driven by innovation and the demand for region-specific AI solutions.

For developing nations, investing in AI-enabled digital infrastructure presents a transformative opportunity. It can unlock new markets, enhance workforce efficiency, and raise overall quality of life. However, without intentional action to close the connectivity gap, these benefits will remain unevenly distributed, deepening the divide between and within countries.

Bridging the digital divide is essential for widespread economic growth. Expanding access to connectivity, skills and AI tools has the potential to empower millions, foster entrepreneurship, and support sustainable development. As AI continues to evolve, its trustworthy and secure implementation in developing regions will play a critical role in shaping a fairer, more prosperous global economy.

Category	Details
Expanding Connectivity	Cisco's rural broadband projects have connected millions in underserved areas globally.[94] In Kenya, mesh networks deployed by Cisco have provided high-speed Internet access to over three million people in remote regions. These efforts enable farmers to use precision agriculture tools while facilitating telemedicine services for rural clinics.
Workforce Training Programs	Cisco's Networking Academy has trained over 20 million students worldwide in networking, cybersecurity and AI certifications. In developing countries alone, half a million students gained certifications in 2024, with graduates earning wages 35% higher than their peers.[95] By focusing on STEM education and digital literacy programs tailored to local contexts, Cisco ensures that communities can actively participate in, and benefit from, the AI-driven economy.
Digital Transformation Centres (DTC) Initiative	As a founding partner of the ITU's Digital Transformation Centres Initiative, Cisco is working to strengthen digital skills and entrepreneurship in underserved communities worldwide. Through this collaboration, over 300,000 learners across 4 regions have received training in foundational and advanced ICT skills, including cybersecurity, data analytics, and AI literacy. Cisco's support ensures that local institutions – especially in Africa, Latin America, and Asia, are equipped to deliver demand-driven training, bridging the gap between connectivity and meaningful digital participation.[96]

3.2 Recommendations

Government

State and local governments play a key role in establishing the right enabling conditions for connectivity development by designing a regulatory environment that supports private sector innovation and investment. To minimize unnecessary delays to digital development, policymakers should streamline licensing and permitting rules for new projects to accelerate connectivity expansion. Such efforts should focus on modernizing existing equipment, removing unsupported devices that could pose security risks, improving infrastructure access policies, encouraging proposals to utilize existing towers, piping and utility ducts for basic construction. Regulatory bodies should also simplify spectrum access frameworks, offering expanded usage for wireless middle- and last-mile connectivity providers while ensuring this usage offers clear public benefit. As a complement to exclusive licensing, offering specific frequency bands for public use through 'unlicensed spectrum' policies can accelerate connectivity development with minimal interference to critical infrastructure. Finally, duty-free treatment of ICT products lowers prices and increases choice, reducing barriers to entry for local ISPs and new users.

In parallel, governments should establish sufficient market incentives and encourage data protection and security to build trust in digital systems and accelerate adoption, ensuring a good balance between privacy protections and facilitating data flows, trade and economic growth. Access to connectivity is not an end in and of itself, as the ITU estimates that one in three individuals who could go online chooses not to do so.[97] Demand capped by concerns of a range of digital harms, such as identity theft and privacy breaches, threatens to suppress potential market size, further limiting private sector investments. Developing norms and sharing best practices for how to protect users against such risks will help support market and network growth by encouraging those who can connect to do so. Governments have been making great progress on this front, so the outlook is encouraging.

Private Sector

The private sector's financial, commercial, and scientific advantages are critical in building digital infrastructure. Companies can provide front-end investments to develop the physical and digital components of AI enablers, while advising government on best practices. Recognizing the untapped potential investment returns in developing markets, telecommunications companies can design, construct, and operate the needed infrastructure elements to connect AI applications to processing centers.

Companies can provide front-end investments to develop the physical and digital components of AI enablers. Besides exercising their financial muscles to invest and construct essential infrastructure elements in developing markets, the private sector can also leverage its power in market analysis to provide insights into consumer demands, challenges, and specific user needs that vary in countries and regions and advise governments on bespoke policy implementation. Industrial experts in the private sector are crucial in this development phase, where expertise and innovative capacity are necessary to improve access and lower costs for new and existing users, and such actions can position them well to capitalize on expected economic growth fueled by an AI economy.[98]

Simultaneously, the private sector can leverage their talent networks to support AI capacity building and workforce development, offering training and skills-development initiatives to communities across the world, with a particular focus on emerging markets. Courses, workshops, and other educational investments in individuals and local organizations can cultivate relevant skills for AI-related fields and diversify avenues for AI deployments, improving the reach of their infrastructure projects and maximizing their investment returns.[99]

Public-Private Partnerships

Middle-mile and last-mile solutions offer key opportunities for public-private partnerships, prioritizing service affordability for users. Infrastructure-based competition certainly delivers consumer benefits with high returns on investment in developed markets, where sufficient funding and purchasing power can sustain large and multiple investments.[100] However, this model produces poor results in developing markets with less developed infrastructure. Instead, public-private partnerships could focus on sharing resources with existing utilities by utilizing already built pathways – roads, railways, transmission grids – to lower connectivity costs to users.

These partnerships can also reach a global scope, with governments assisting in establishing relationships between private sector actors across borders. Organizations like the International Finance Corporation successfully develop partnerships between firms in developed and emerging economies; governments like South Africa and Singapore have signed Memorandum of Understandings (MoUs) with leading tech and telecommunications companies like Oracle, Cisco, HTX, and Salam to strengthen the countries' digital infrastructure and economy.[101] These examples showcase the value of incorporating expertise in both the public and private sectors in accelerating digital development.[102]

International organizations

The global nature of the digital development challenge necessitates involvement from international organizations, whose reach can identify specific requirements and help to connect collaborative parties. The ITU, through initiatives like Giga and its Connectivity Target Tracker, provides technical diagnostics and financing roadmaps to help countries expand last-mile access, particularly for schools and rural communities. These tools enable governments to prioritize AI-ready infrastructure. Financial organizations should also help raise, consolidate, and allocate monetary assistance for development projects in under-resourced regions, directing investments toward shovel-ready projects. Furthermore, global organizations can connect infrastructure companies with emerging customer bases in new countries, fueling mutually beneficial growth in otherwise disconnected economies.[103]

Other international organizations can play critical roles in shaping rules and norms of AI development and usage across digital architectures. Notably, leading institutions have already shaped agreements on standards development,[104] ethical applications,[105] and guiding principles.[106] However, these milestones likely reflect early iterations of solutions that will require continued refinement and revision as the global community adapts to the AI economy. Aligning standards and principles enables smoother data sharing, expands digital infrastructure and AI adoption, and lowers market barriers – helping companies and SMEs scale AI-enabled businesses.

Civil Society

In parallel, the intellectual strengths, convening capacities, and robust networks of civil society organizations form comparative advantages in facilitating agreements and shaping norms around digital connectivity. Nested between public and private sectors, these institutions can leverage their research and analysis power to continue to identify critical areas of investment for AI infrastructure, particularly in resource-constrained regions. They can utilize their broad, transnational relationships to connect and encourage financial institutions with needed investments in core elements of connectivity in emerging markets. Furthermore, civil society can convene private and public sector stakeholders to advance dialogue around best practices, policies, and standards that broaden the reach of AI's benefits, such as establishing frameworks for cross-border data transfers, aligning global data privacy mechanisms, and fostering trust in data sharing agreements.

4 Conclusion

Unlocking AI's full potential requires a strong foundation of digital connectivity. AI and connectivity are deeply interdependent – each shaping and strengthening the other. To fully realize AI's transformative promise, global efforts must prioritize the expansion of digital infrastructure and the bridging of persistent connectivity divides. In parallel, AI enhances connectivity through advanced network management, energy-efficient operations, and proactive security frameworks.

By investing in resilient infrastructure and leveraging AI to optimize networks, multi-stakeholder approaches can build systems that are more efficient and increase access to essential digital tools. The risks of a growing digital divide are significant, but there are also opportunities for growth if policymakers, civil society, the private sector, and multilateral institutions collaborate to drive progress.

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International Telecommunication Union
Place des Nations
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Switzerland

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