Foreword

In an increasingly connected world, access to meaningful and affordable connectivity is not a privilege it is a fundamental enabler of social and economic development. Yet, for billions around the globe, especially in underserved and remote communities, this promise remains unfulfilled. Bridging the digital divide requires more than expanding coverage; it demands a new paradigm of transformational connectivity, one that unlocks opportunity, drives innovation, and ensures no one is left behind.

The International Telecommunication Union (ITU) and Ericsson share a common vision: to accelerate digital inclusion through data-driven strategies, innovative tools, and strong partnerships. Together, we are developing a suite of solutions including the Connectivity Planning Platform (CPP), the Transformational Connectivity Playbook, and targeted capacity-building initiatives that place evidence-based planning at the heart of connectivity development.

This brief on bridging the digital divide highlights the critical role that accurate data, intelligent mapping, and collaborative planning play in achieving universal, sustainable, and inclusive connectivity. These elements are not only technical requirements, they are the foundation for impactful policymaking, investment prioritization, and long-term national digital strategies.

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Bridging the digital divide: A data-driven approach to transformational connectivity

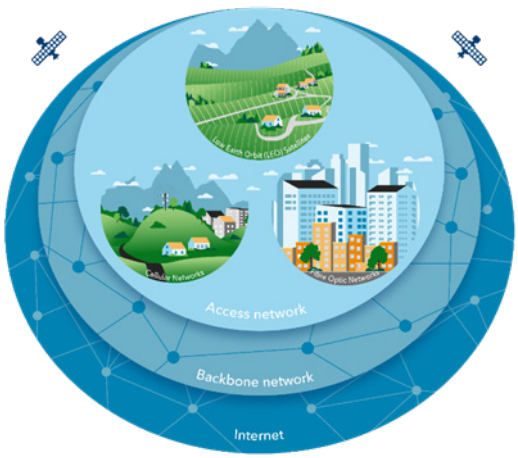
Transformational connectivity extends beyond merely expanding Internet access, it involves unlocking new opportunities, driving innovation, and fostering economic and social growth in underserved communities. Achieving this level of connectivity is essential for bridging the digital divide and aligning with global objectives, such as the Sustainable Development Goals (SDGs). To realize this vision, data driven strategies, collaborative planning, and thoughtful technology selection must be prioritized in decision-making processes.

The International Telecommunication Union (ITU) supports Member States to achieve their digital transformation objectives, and in collaboration with Ericsson, will develop a suite of tools and resources throughout 2025 and 2026.

These initiatives are designed to capture, visualize, and analyse ICT infrastructure, and include the Connectivity Planning Platform (CPP), the Transformational Connectivity Playbook, and a series of capacity-building workshops related to CPP. Collectively, these tools and resources will empower stakeholders to effectively plan and evaluate their digital infrastructure, aiming to bridge the digital divide, expand meaningful connectivity, and foster inclusive and sustainable connectivity ecosystems.

This brief underscores the importance of data, mapping, and analysis in crafting transformative connectivity solutions, as well as showcasing how the collaboration between ITU and Ericsson offers essential resources for data-informed decision-making. These tools are vital for connecting the unconnected, advancing transformational connectivity, and supporting the achievement of the SDGs.

Main connectivity alternatives for fixed locations



Introduction

In today's digital age, connectivity is a fundamental driver of social, economic, and environmental progress. Yet, billions of people remain disconnected especially in rural and underserved regions limiting access to vital services such as healthcare, education, and economic opportunities. This digital divide deepens global inequalities and hampers inclusive development. To address these challenges, transformational connectivity is critical: an approach focused on delivering inclusive, sustainable, and future-ready connectivity solutions that reach everyone, everywhere.

Transformational connectivity refers to the comprehensive strategy that revolutionizes the design and implementation of connectivity solutions to ensure they are inclusive, sustainable, and adaptable to future needs. This approach emphasizes advanced connectivity technologies such as 5G, which enable the delivery of enhanced services including telemedicine, remote education, and smart agriculture, thereby accelerating socio-economic development in underserved regions.

Achieving transformational connectivity is a complex and multifaceted task. It requires overcoming significant barriers including affordability, infrastructure gaps, and digital literacy. Most importantly, it demands data-driven strategies that enable stakeholders to accurately identify connectivity deficits, select the most appropriate technologies, and design long-term, sustainable deployment plans.

In response to these challenges, groundbreaking solutions are essential for empowering decision-makers to effectively navigate the complexities of connectivity deployment. This brief introduces the innovative Connectivity Planning Platform (CPP), a geographic information system-based planning tool, and the accompanying capacity-building programmes developed by ITU in partnership with Ericsson. These resources empower decision-makers with actionable insights and the skills necessary to bridge the digital divide, accelerating equitable connectivity and fostering inclusive global development.

Harnessing connectivity for inclusive growth and innovation

In an increasingly digital world, transformational connectivity has become a foundational element of social and economic progress. It ensures that all people, regardless of location, income, or education, can access meaningful digital tools and services, such as healthcare, education, financial platforms, and civic engagement resources. This access empowers individuals and communities to fully participate in the digital economy, fostering innovation, inclusion, and sustainable development.

Bridging the digital divide

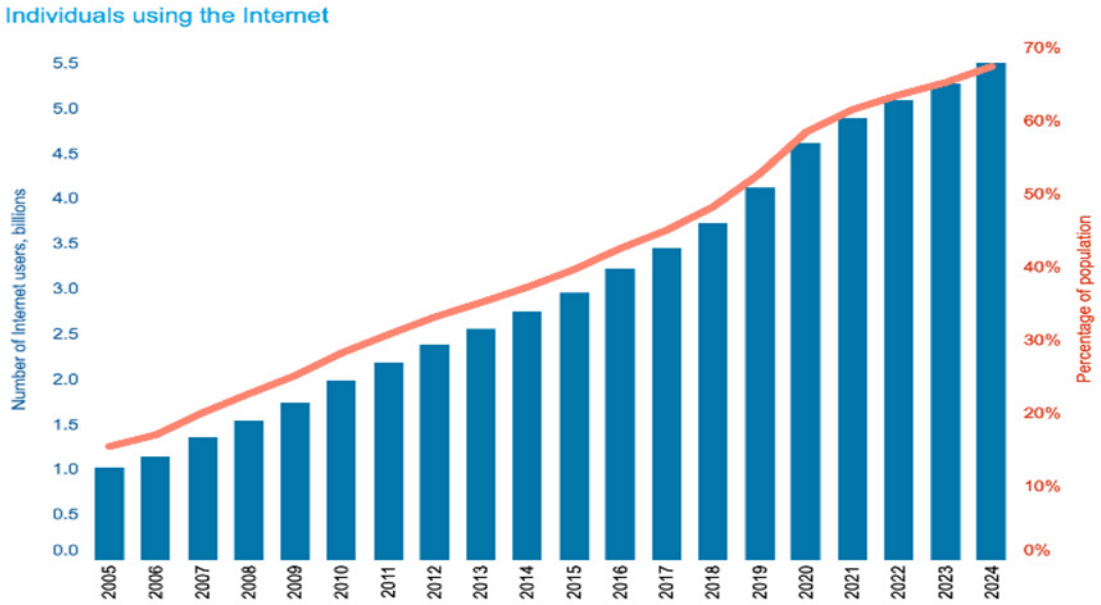
Despite progress, 2.6 billion people remain offline, primarily in developing regions. This persistent digital divide hinders economic and social development and exacerbates inequality. Bridging this gap requires investment in digital infrastructure, affordability measures, digital literacy programmes, and safeguards for cybersecurity and privacy.

To ensure these efforts are effective and targeted, there is a critical need for accurate infrastructure data and open planning platforms. These tools help map underserved areas, identify connectivity gaps, and guide strategic deployment of resources. Transparent, data-driven planning enables governments, private sector partners, and development agencies to coordinate more effectively and avoid duplication, ensuring that digital inclusion initiatives reach the communities that need them most. Digital inclusion is essential for empowering individuals and unlocking the full potential of societies in the digital age.

Building universal connectivity

Achieving universal connectivity requires collaboration across sectors, with a focus on connecting key institutions such as schools, hospitals, and libraries. Public-private partnerships, strategic data mapping, and targeted investments are crucial for extending access to underserved areas. Over the past decade, the expansion of mobile broadband has increased Internet access in low- and middle-income countries by 50 per cent, highlighting the progress made and the potential for further growth. Ensuring digital systems are secure, scalable, and resilient is essential for sustaining this progress and protecting against vulnerabilities. Additionally, promoting digital literacy empowers individuals to safely and effectively engage with digital tools and platforms, fostering a more inclusive and informed society.

Annual Internet usage percentages worldwide



Driving innovation and technological development

Transformational connectivity is the backbone of innovation, driving the scaling and integration of emerging technologies across various sectors. Technologies such as artificial intelligence (AI), Internet of Things, blockchain, and advanced mobile networks thrive on robust connectivity, offering transformative potential that impacts global economic growth and environmental sustainability. Connectivity enables smarter agriculture, more efficient healthcare, and energy-saving solutions, underscoring its role as a catalyst for innovation.

As connectivity continues to improve, it empowers stakeholders to bridge the digital divide, fostering inclusive and sustainable ecosystems. This evolution in digital networks accelerates the adoption and expansion of emerging technologies, contributing significantly to global GDP. 5G alone is projected to add USD 2.2 trillion by 2034. By providing high-speed, low-latency, and programmable network solutions, transformational connectivity ensures that these technologies can be effectively scaled, supporting a future where economic growth aligns with environmental sustainability and societal progress.

Strengthening digital infrastructure in a rapidly changing world

To ensure access to fast and dependable Internet for all, strong strategies are needed to overcome key connectivity deployment barriers. The rapid pace of technological advancement presents both challenges and opportunities, allowing us to rethink how people and businesses connect on a global scale.

A data-driven approach is crucial for this effort, as it enables informed decision-making to address specific connectivity gaps. A connectivity planning tool can be instrumental in identifying these gaps, evaluating technological options, and analysing financial outcomes.

By leveraging data, the effectiveness of various solutions can be assessed, such as optical fibre, cellular networks, and Low Earth Orbit (LEO) satellites. By focusing on data-driven decision making, approaches can be not only innovative but also sustainable and equitable, achieving meaningful connectivity for all.

Policy and regulatory considerations

Policy and regulatory frameworks play a crucial role in the deployment and use of connectivity infrastructure. Policy-makers have a unique opportunity to drive widespread connectivity by prioritizing three key areas: enhancing private sector investment, addressing market shortcomings, and boosting demand. Investment can be stimulated through spectrum fee trade-offs, tax incentives such as Germany's 30 per cent and the United Kingdom's 25 per cent deductions, and the stripping away of site access barriers. Substantial public funds, such as the Euro 67 billion from the European Commission and Euro 42.5 billion from the United States, are crucial to overcome market failures. In addition, the leveraging of infrastructure data and visualization helps to identify connectivity gaps and guide targeted interventions.

On the demand side, promoting digital skills, reducing device costs, and removing taxes on connectivity services can significantly increase adoption. Digital public services play a pivotal role as anchor tenants, encouraging investment and catalysing usage. By grounding strategies in evidence-based insights, policy-makers can foster inclusive growth, ensuring efficient infrastructure deployment and broader connectivity access.

To achieve universal connectivity, policy must be dynamic, inclusive, and informed by actionable infrastructure intelligence. Governments can harness geospatial and network data to simplify licensing, reduce spectrum fees, and coordinate cross-border infrastructure efforts. By integrating data and visualisation into the regulatory process, decision-makers can remove deployment bottlenecks, reduce costs, and ensure that connectivity strategies are aligned with on-the-ground realities to deliver faster and fairer digital access for all.

Technical and logistical considerations

Technological complexity primarily arises from urban-rural disparities: rural areas must overcome challenges related to terrain and low population density, while urban areas need to balance network performance with energy consumption. Beyond these technical obstacles, logistical and regulatory issues critically influence the speed and cost of deployment.

Furthermore, connectivity infrastructure must be resilient to natural disasters and climate-related events. As climate change leads to more frequent extreme weather, it is crucial to construct infrastructure that can withstand such forces, especially in regions prone to floods, earthquakes, landslides, or storms. Building durable and adaptable connectivity systems is vital for ensuring long-term sustainability and reliability in the face of environmental challenges.

Infrastructure data and visualisation tools can play a key role in addressing these complexities. By mapping infrastructure assets, environmental risks, population density, and connectivity gaps, these tools enable more informed decision-making around network design, resource allocation, and risk mitigation. For example, visual overlays of flood zones or seismic activity can guide the placement of fibre-optic routes or towers, while infrastructure readiness maps can help prioritise investments in underserved areas. These insights also support more coordinated planning across agencies and stakeholders, ensuring that technical, logistical, and environmental considerations are integrated into infrastructure strategies from the outset.

Ultimately, achieving meaningful connectivity goes beyond merely establishing infrastructure; it is about ensuring that all individuals have access to reliable, high-speed Internet that empowers communities. By addressing these complexities and prioritising the needs of underserved populations supported by data-driven planning, a more inclusive and resilient digital future can be built, where technology serves as a catalyst for social and economic development.

Financial investment needs

Building meaningful connectivity infrastructure requires substantial financial investment. For developing countries or underserved areas, the cost of building fibre-optic networks or cellular towers can be prohibitive. Budget constraints may limit government capacity to finance large-scale infrastructure projects, making public-private partnerships essential. Here, private companies often provide the bulk of investment in exchange for long-term contracts or incentives.

Another financial challenge is the return on investment (ROI). In densely populated urban areas, ROI can be favourable as many users quickly subscribe to services. However, in rural or remote regions, the low population density can significantly reduce ROI, discouraging private investment without subsidies or government-backed programmes.

Infrastructure data, geographic information systems (GIS), and visualisation tools can play a critical enabling role in addressing these investment challenges. By providing spatially rich, evidence-based insights, these tools help governments and investors assess where infrastructure deployment will have the most social and economic impact and where support mechanisms such as subsidies or blended finance are most needed.

For example, GIS maps can identify areas with no or poor connectivity and overlay them with socio-economic data, school and health facility locations, or population movement patterns. This allows planners to prioritise infrastructure projects that deliver the highest development value. Similarly, data-driven network cost modelling can simulate various deployment scenarios (e.g., optical fibre vs. wireless) to determine the most cost-effective solutions for a given geography.

These tools also help de-risk investments by making coverage gaps, market potential, and terrain-related costs more transparent. This clarity increases investor confidence and supports the design of tailored financing mechanisms such as results-based funding, shared infrastructure models, and performance-linked subsidies.

Moreover, in multi-stakeholder initiatives, data visualisation platforms can serve as coordination hubs, aligning public and private actors around shared infrastructure priorities and timelines. By fostering a collective understanding of needs, gaps, and opportunities, infrastructure intelligence platforms can reduce duplication, optimize resource allocation, and support equitable infrastructure development.

Despite financial hurdles, innovative funding models such as blended finance and impact investment can bring together public, private, and philanthropic capital to build infrastructure that benefits society. When coupled with robust data and infrastructure intelligence, these strategies become even more powerful in overcoming financial barriers and ensuring that connectivity reaches those who need it most.

Technology options for transformational connectivity

Building meaningful connectivity infrastructure involves significant challenges that vary widely across regions. Remote and rural areas face obstacles such as challenging terrain, sparse populations, and high deployment costs. In contrast, urban environments must navigate issues related to network performance, spectrum availability, and energy consumption. Furthermore, no single technology can adequately address all scenarios. To navigate this complexity, advanced modelling capabilities are needed to analyse three primary and complementary connectivity technologies: optical fibre, cellular, and Low Earth Orbit (LEO) satellites. Tools that allow decision-makers to explore the advantages and constraints of each technology in different scenarios are essential to determine the most appropriate solutions based on regional characteristics and use cases.

For instance, such tools can simulate fibre-optic deployments in areas where high capacity and reliability are essential but challenging terrain raises costs. They can also evaluate cellular network expansion in urban or peri-urban areas, balancing coverage, capacity, and energy efficiency.

By enabling scenario modelling that combines these technologies, tools help stakeholders design hybrid infrastructure strategies that optimize performance, cost, and resilience. This data-driven approach supports tailored investment decisions and policy frameworks that address the unique challenges of each region.

The substantial barriers to infrastructure development can be overcome through informed planning. Leveraging the complementary strengths of optical fibre, cellular, and satellite technologies, alongside financial modelling, which will accelerate the delivery of transformative connectivity solutions that drive inclusive social and economic progress.

Fibre-optic networks

Fibre-optic networks transmit data via light signals through glass fibres, delivering ultra-high speeds and minimal latency. Ideal for urban centres, business districts, and high-density areas. The table below summarizes their key advantages and limitations:

Advantages:

- **Unmatched speed**: Optical fibre provides fast Internet speeds, making it ideal for industries that require significant bandwidth, such as tech startups, media companies, or healthcare facilities, as well as providing high capacity backhaul for 4G, 5G and future technology evolutions.
- **Future-proof infrastructure**: Once deployed, fibre-optic infrastructure can support future technological advancements, accommodating growing data demands over time.
- **Low latency**: The minimal latency of optical fibre makes it ideal for applications requiring real-time data transfer, such as video conferencing, stock trading or online gaming.

Limitations:

- **High initial costs**: Deploying optical fibre is capital-intensive, requiring significant upfront investment, particularly in rural areas where the cost per connection is higher.
- **Deployment challenges**: The need for physical cables means that fibre-optic deployment can be slow, particularly in regions with challenging terrain or regulatory hurdles, such as securing land access, permits for digging or underwater installations, and compliance with local, environmental and safety regulations.
- **Environmental impact**: Optical fibre deployment involves substantial construction work, which can disrupt land and contribute to greenhouse gas emissions.

Cellular networks

Cellular networks use wireless base stations to provide Internet access for mobile devices or fixed terminals via technologies such as 4G and 5G. Their flexibility and rapid deployment make them a cost-effective solution for suburban and semi-rural areas where they have a number of key strengths and challenges.

Advantages:

- **Cost-effective and rapid deployment**: Fixed wireless access is generally more economical and faster to deploy than optical fibre, especially in regions with existing cellular infrastructure.
- **Scalability and upgradability**: As cellular technology advances, cellular networks can be upgraded without requiring extensive changes to physical infrastructure.
- **High-speed connectivity**: Fixed wireless access, particularly over 5G networks, provides impressive speeds and low latency, supporting data-intensive applications and ensuring a reliable user experience.

Limitations:

- **Coverage challenges**: Cellular networks may be less effective in rural or remote areas with limited tower coverage, resulting in inconsistent connectivity.
- **Network congestion**: High demand in densely populated areas can lead to congestion, reducing performance as more users connect to the same cell tower.
- **Dependence on power supply**: Cellular networks rely on continuous power for base stations, making them vulnerable during outages, especially in regions lacking backup infrastructure.

Low Earth Orbit (LEO) satellites

Low Earth Orbit (LEO) satellites leverage constellations in near-Earth orbits to enable global Internet coverage, especially in remote regions (e.g., oceans, deserts) where traditional infrastructure is impractical. While their latency is significantly lower than traditional satellites, challenges include high costs and environmental impacts.

Advantages:

- **Universal reach**: LEO satellites can provide connectivity in the most remote regions, including deserts, mountains, and maritime environments, where traditional infrastructure is impractical.
- **Improved latency**: While LEO satellite latency cannot match that of fibre-optic or cellular networks, it is significantly lower than that of traditional satellite solutions, making LEO satellites suitable for real-time applications such as video calls or streaming.
- **Rapid deployment**: Once a LEO satellite network is established, services can be accessed quickly without requiring extensive ground infrastructure, facilitating faster Internet adoption in underserved areas.

Limitations:

- **High costs**: The infrastructure needed to launch and maintain LEO satellites is expensive, which may translate to higher subscription fees for end-users.
- **Environmental concerns**: The proliferation of LEO satellites raises issues related to space debris and the use of raw materials, impacting the environment. Additionally, the greenhouse gas emissions from launching thousands of satellites are concerning, especially given their limited lifespan before re-entry and incineration in the atmosphere.
- **Weather vulnerability**: Extreme weather conditions can disrupt satellite connections, affecting reliability in certain regions.

ITU tools for developing strategies to achieve transformational connectivity

To effectively address current digital challenges and seize new opportunities, decision-makers need access to advanced solutions. ITU, in collaboration with Ericsson, is developing a Connectivity Planning Platform (CPP) to empower leaders in achieving transformational connectivity.

Connectivity Planning Platform (CPP)

CPP is a powerful, data-driven tool designed to assist decision-makers in visualising, analysing, and addressing infrastructure gaps across diverse geographic and socio-economic contexts. Co-developed by ITU and Ericsson, CPP is built to support evidence-based policymaking and investment planning by integrating multi-source datasets, including geospatial infrastructure data, population distribution, service availability, environmental risk profiles, and socio-economic indicators.

By leveraging GIS and advanced visualisation tools, CPP enables stakeholders to map existing infrastructure (e.g., fibre-optic networks, towers, satellite coverage), identify underserved or high-impact areas, and design targeted, cost-effective interventions. Its intuitive interface supports scenario modelling, allowing users to simulate and compare different connectivity strategies, such as optical fibre, wireless, or satellite and evaluate trade-offs in cost, coverage, resilience, and environmental suitability.

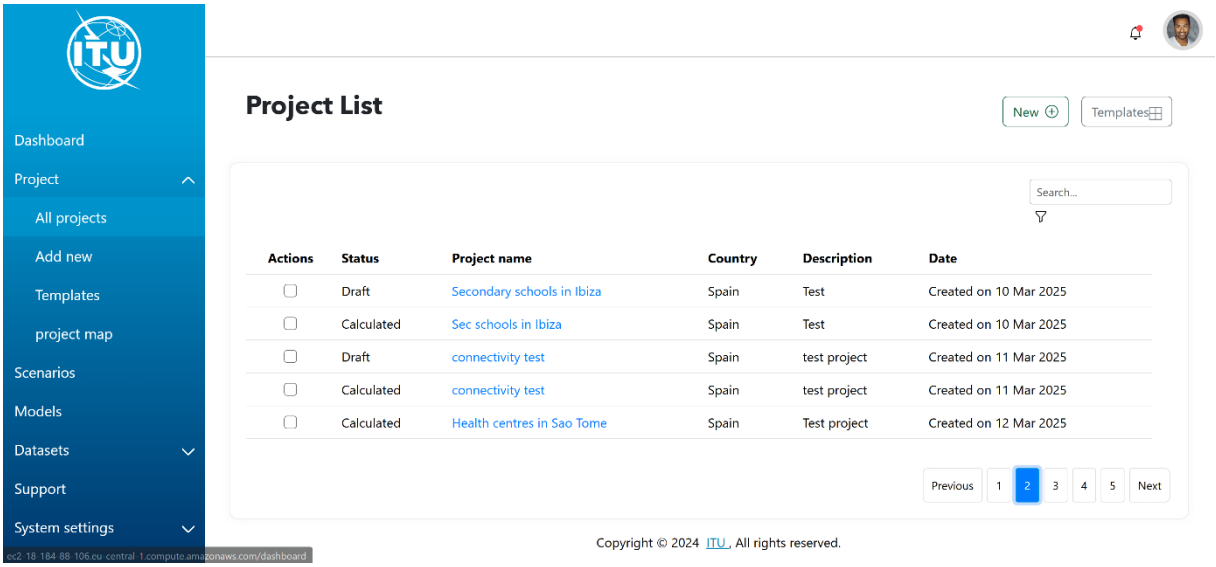
The value-add of CPP extends beyond visualisation. It enables smarter and more transparent infrastructure planning, improving the ability of governments and development partners to prioritise investments based on need, impact, and feasibility. This is especially critical in resource-constrained environments where financial efficiency and return on impact are paramount. For private sector investors, the platform reduces risk by offering insights into market potential, population density, infrastructure readiness, and terrain complexity informing better deployment and partnership decisions.

As a policy enabler, the CPP also helps regulators assess spectrum planning, infrastructure sharing opportunities, and permitting bottlenecks. By aligning stakeholders around a shared understanding of infrastructure challenges and opportunities, the platform fosters coordinated action and more inclusive digital development.

The first version of the CPP is scheduled for release in late 2025. It is currently under active development, with continuous enhancements planned for 2026 and beyond. Future iterations will incorporate AI-driven adaptive learning models that can offer context-aware recommendations on infrastructure deployment strategies, investment prioritisation, and policy interventions. These models will further empower users to make data-informed decisions that are adaptive, scalable, and aligned with both national development goals and the evolving digital ecosystem.

In essence, the Connectivity Planning Platform, co-developed by ITU and Ericsson, is more than a map; it's a strategic infrastructure intelligence system designed to accelerate the deployment of resilient, inclusive, and financially viable connectivity solutions for all.

Screenshot of the connectivity planning dashboard



Transformational Connectivity Playbook

The Transformational Connectivity Playbook is intended to serve as a comprehensive guide for stakeholders to design and implement connectivity solutions based on insights gained from the CPP. It offers detailed methodologies, strategies, and best practices for addressing the complex challenges of connectivity in underserved regions. Focused on data-driven decision-making, the playbook provides stakeholders with a step-by-step approach to building sustainable, inclusive connectivity infrastructure. The playbook is scheduled for release in 2026.

Capacity building programmes

To ensure that stakeholders can fully leverage the potential of the CPP, ITU and Ericsson are committed to delivering comprehensive capacity-building programmes. These programmes are designed to empower decision-makers across all levels, including policy-makers, regulators, industry leaders, and network operators, with the knowledge and skills necessary to effectively interpret and apply the insights generated by the CPP.

The training initiatives will focus on practical, hands-on learning tailored to the diverse needs of participants. This includes understanding how to navigate the platform interface, utilise GIS and scenario modelling features, interpret complex datasets, and integrate these insights into strategic planning and policy formulation. By strengthening digital literacy and data-driven decision-making capabilities, the programmes aim to promote sustainable infrastructure development that is responsive to local contexts and challenges.

Moreover, these capacity-building efforts will foster collaboration and knowledge-sharing among stakeholders, encouraging the co-creation of solutions and the alignment of goals across public and private sectors. Through continuous support and iterative learning, ITU and Ericsson aspire to build a community of informed leaders who can champion innovative, equitable, and resilient connectivity initiatives, ensuring that the benefits of digital transformation reach every corner of the world.

Conclusions

In conclusion, achieving universal, meaningful and transformational connectivity requires overcoming a complex mix of technical, financial, regulatory, and environmental challenges, especially in underserved and resource-constrained regions. Infrastructure data and visualisation tools, such as the CPP co-developed by ITU and Ericsson, offer a transformative approach to these challenges. By integrating diverse datasets and providing actionable insights through GIS and scenario modelling, the CPP empowers decision-makers to design targeted, cost-effective, and resilient infrastructure strategies.

This data-driven approach not only improves investment prioritisation and reduces deployment risks but also enhances regulatory coordination and fosters inclusive policies that accelerate connectivity. As the CPP continues to evolve with upcoming features including AI-powered advisory learning models, it will increasingly serve as a strategic intelligence system, guiding stakeholders toward scalable and sustainable connectivity solutions.

By harnessing the power of infrastructure intelligence, governments, private investors, and development partners can work together more effectively to bridge the digital divide. This collaborative, evidence-based framework is essential to building a resilient and inclusive digital future where connectivity acts as a catalyst for social and economic development, empowering communities everywhere.

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