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**REPORT**

# ITU - ITTLLDC Seminar 2025:

Cooperation for sustainable space connectivity, spectrum use and Early Warning Systems

**28 – 29 August 2025**

**Ulaanbaatar, Mongolia**

1. **Introduction**

Since 2023, the International Telecommunication Union (ITU) and International Think Tank for Landlocked Developing Countries (ITTLLDC) have been collaborating to co-organize annual events that focus on the unique challenges faced by the Landlocked developing countries (LLDCs) in developing their digital economies. These events provide a ​platform to discuss and put forward possible solutions that can leverage technological evolutions for sustainable digital development in these regions.

Building on these past impactful engagements, ITU and ITTLLDC co-organised this seminar in 2025 on the theme “Cooperation for Sustainable Space Connectivity, spectrum use, and Early Warning Systems”. The event was supported by Ministry fo Digital Development, Innovation and communications (MDDIC) and Communications Regulatory Commission (CRC) of Mongolia.

The event discussed key items related to LLDCs in CIS (Commonwealth of Independent States) and Asia-Pacific including:

* Promoting international cooperation in the use of space, satellite and non-terrestrial digital connectivity solutions
* Cross border RF interference mitigation
* Leveraging digital networks for Early Warning dissemination
* Affordable international connectivity for LLDCs​

The event brought together participants from Asia-Pacific and CIS regions with specific focus on Landlocked Developing Administrations and domain experts.

The seminar consisted of following sessions:

1. Developing a national satellite program: considerations and case studies
2. Leveraging digital networks for Early Warning dissemination
3. Presentation on E-Mongolia best practice
4. Innovation Cafe on "Enhancing Digital Connectivity in LLDC's"
5. Cross Border RF interference mitigation
6. Panel Discussion on "International Digital Connectivity for LLDC's"

The detailed agenda and meeting content is available at event webpage <https://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/Pages/Events/2025/ITTLLDC%202025/main.aspx> .

1. **Workshop Summary**

The event commenced with a recorded video address from **Dr. Cosmas Zavazava, Director Development Bureau of ITU** who underscored the unique digital challenges faced by Landlocked Developing Countries (LLDCs), particularly their reliance on vulnerable submarine cables and expensive terrestrial infrastructure, which leads to higher costs and instability. He emphasized the role of satellite technology as a critical, immediate solution for geographical barriers, promote inclusivity, and deliver vital e-services. He encouraged to put in place regulatory frameworks that balance innovation with fair competition and highlights ongoing international efforts, including upcoming ITU conferences, to ensure that LLDCs are no longer isolated from digital opportunities. Being LLDC means landlocked, but it should not be considered as opportunity locked.

**Mr. Dulguun Damdin-Od, Executive Director, International Think Tank for LLDCs (ITTLLDC)**, welcomed delegates to Mongolia and expressed his thanks to ITU for continued cooperation. He highlighted that LLDCs are characterised by their geographical isolation and lack of direct access to seashore and submarine cables. This fact results into significant high reliance on the interconnection to terrestrial telecom infrastructure of neighbouring states. As a result, developing resilient and affordable digital connectivity is a big challenge for LLDCs. Consequently, the importance of satellite technologies for LLDCs become more profound and invited the participants to explore the potential of satellite systems in digital inclusion of inhabitants in the geographically remote areas. He encouraged development and adoption of enabling regulations to harness the benefits of low-orbit satellite constellations and BB connectivity services thereby offered

On behalf of the Communications Regulatory Commission (CRC) of Mongolia **Dr. Tsendsuren Chuluunbaat, Director General, Radio Frequency Regulation and Monitoring Department**, – welcomed the participants of the seminar in Mongolia. He emphasised that for the time being LLDCs were facing challenges in providing affordable connectivity especially in the countries with the extended landmass and low density of population. Mr Chuluunbat noted that the seminar was the valuable event in sharing knowledge on how new regulatory methods that could be introduced and wished the participants to have the fruitful discussion on these and other relevant matters.

1. **Sessions**

**Session 1: Developing a national satellite program: considerations and case studies**

Moderated by **Mr. Farid Nakhli, Programme Coordinator at ITU**, the session covered important aspects involved in developing a national satellite programme such as the technical and infrastructure requirements, funding and budgetary aspects, capacity building, operations and maintenance and challenges as well as mitigation strategies among others.

**Mr. Aamir Riaz** of the ITU framed the session by charting the explosive growth and transformation of satellite connectivity, projecting a surge in capacity driven by NGSO systems and new technologies. He outlined a future of hybrid networks and direct-to-device services, stressing that harmonized international regulation and sustainable practices are essential to manage this expansion, bridge the digital divide, and support a global space economy poised to reach $1.8 trillion by 2035 as estimated by World Economic Forum.

**Ms. Marion Emma, DLA Piper LLC** outlined the complex U.S. satellite regulatory framework, explaining how a suite of agencies—from the FCC to NOAA—orchestrate licensing, safety, and sustainability efforts. She emphasized that as new technologies emerge, this interagency collaboration and proactive policy development are crucial for fostering innovation while ensuring safe and compliant operations in space.

**Mr. Ilkin Aliyev, Radiofrequency Coordination Engineer, Azercosmos, Azerbaijan** presented the role of Azercosmos, as national space agency, in leveraging satellite technology to enhance digital connectivity and bridge the digital divide in Azerbaijan and other Landlocked Developing Countries (LLDCs). It highlighted key services, including telecommunications, Earth observation, and satellite internet, which are crucial for supporting socio-economic development, improving government services, and fostering regional cooperation. The overarching goal is to position space technology as a vital infrastructure for achieving digital transformation and meeting the sustainable development goals in LLDCs.

The subsequent Q&A session addressed key regulatory challenges. A delegate from Cambodia inquired about licensing for US operators filing abroad, receiving a confirmation that it is not required. On balancing national security with innovation, Marion emphasized the US focus on establishing agile policies to rapidly deploy technology. Regarding D2D regulations, she advised that while terrestrial spectrum reuse works in large countries like the US, a space-based regulatory approach is better suited for regions with border and interference concerns.

**Special Presentation, Mr. Tulga Sukhdorj, Digital Transformation, E-Mongolia Best Practice**

**Mr. Tulga Sukhdorj** detailed Mongolia's remarkable digital transformation, where the state-led E-Mongolia platform has catapulted the nation to 46th in the global e-government rankings. By moving over 1,263 services online for its 2 million users, the initiative has saved an estimated $460 million in costs and drastically reduced paper consumption. Future involve expanding into AI and digital payments, showcasing a strategic model for using technology to drive efficiency, inclusion, and sustainable governance.

**Session 2: Leveraging Digital Networks for Early Warning Dissemination**

Moderated by **Mr. Aamir Riaz** from the ITU, this session highlighted the critical role of digital advancements in early warning dissemination. The discussion promoted the adoption of Artificial Intelligence for predictive analytics and championed Cell Broadcast as a vital national solution for sending life-saving alerts to entire populations.

**Mr. Komil Sultanov**, from **Tajikistan**, emphasized the importance of digital networks for landlocked, disaster-prone nations. He noted that mobile networks cover over 95% of Tajikistan's population and highlighted the successful use of Cell Broadcast technology to deliver instant alerts without overloading networks. He underscored the potential of Non-Terrestrial Networks (NTN) and Direct-to-Device (D2D) solutions to reach remote, mountainous areas and called for updated regulatory frameworks to establish Cell Broadcast as a national standard and facilitate crucial data sharing among agencies.

**Mr. Huo from ZTE** then showcased the company's integrated Emergency Communication Solutions. His presentation detailed a multi-layered network using UAVs, tethered airships, emergency vehicles, and portable base stations designed to rapidly restore connectivity when terrestrial infrastructure is destroyed. He demonstrated how these platforms provide vital LTE coverage and satellite backhaul for rescue teams, supported by case studies from field tests that proved their effectiveness in maintaining communication under the most challenging conditions.

**Mr. Pomaama Liu from Tonga’s Ministry of MEIDECC** outlined the unique challenges faced by remote island nations exposed to cyclones and tsunamis. He highlighted the critical need for robust early warning systems to protect their dispersed population, referencing the prolonged connectivity loss during the 2022 volcanic eruption. Liu recommended adopting cell broadcast alerts and expanding satellite-based NTN and D2D technologies to complement existing systems, calling for stronger regional partnerships and investment in resilient networks.

Finally, a remote presentation from Mr. Amila of the ITU stressed that Landlocked Developing Countries (LLDCs) require a multi-channel strategy for early warnings. He argued for a resilient digital safety net that integrates cell broadcast, SMS, OTT platforms, and traditional media. He concluded that the entire system's success depends on strong national coordination, clear regulation, and collaborative governance between all stakeholders to create a standardized and inclusive early warning system.

**Innovation Cafe on role of innovation to enhance digital connectivity in LLDCs**

Facilitated by **Ms. Akanksha Sharma of the ITU**, the Innovation Café fostered an open exchange on leveraging innovation to overcome the unique digital connectivity challenges faced by Landlocked Developing Countries (LLDCs) like Mongolia. Using an interactive format, the session explored creative technological and policy solutions to improve affordability, resilience, and inclusivity. With the help of Menti meter, following guiding questions were asked in an interactive format:

1. *What are the most pressing connectivity challenges that LLDCs face today, where innovative approaches either technological or policy could be useful?*
2. *How could upcoming satellite technologies, such as Non-Terrestrial Networks (NTN) and Direct-to-Device (D2D) services, be creatively integrated with terrestrial networks to expand reach and resilience?*
3. *How do you think the increasing competition in satellite-based connectivity offering will impact affordability of terrestrial international connectivity?*
4. *What innovative strategies could LLDCs adopt to ensure their digital infrastructure is resilient to unavailability while remaining adaptable to future technologies?*

**On pressing challenges**, participants identified high costs, dependence on transit countries, difficult geography, energy constraints, lack of access to submarine cables, and a shortage of skilled workers as major barriers. The group unanimously advocated for stronger regional cooperation, suggesting that LLDCs negotiate as a bloc and leverage forums like the Asia-Pacific Telecommunity (APT) to increase their collective bargaining power.

**Regarding the integration of new satellite technologies**, there was a clear need for access to best practices in policy and regulation to help build national plans. A key suggestion was to use Non-Terrestrial Networks (NTNs) as a backup during emergencies for vital services. Member states proposed working through regional organizations to develop joint recommendations, with Mongolia specifically highlighting the necessity for clear regulatory frameworks.

**On the impact of satellite competition**, participants expressed a desire for studies to map future scenarios. The consensus was that satellite-based connectivity would not replace terrestrial networks but would instead discipline prices, improve resilience, and expand choices, ultimately leading to more affordable and inclusive international connectivity. Cybersecurity was also raised as a paramount concern accompanying these advancements.

**For building resilient and adaptable infrastructure**, several innovative strategies were proposed. These included establishing local or regional Internet Exchange Points (IXPs) and data centers to host local content, as suggested by Pakistan. Participants advocated for a hybrid, flexible ecosystem supported by adaptive policies and a major focus on training and capacity-building programs to develop the local workforce needed for the future.

The innovation cafe session brought us to the end of Day 1.

**Session 3:** Cross border RF interference mitigation

Day 2 opened with a session addressing the growing challenge of cross-border radio frequency (RF) interference in the Asia-Pacific region, a problem exacerbated by diverse geography, dense border populations, and varying levels of ICT development.

**Mr. Aamir Riaz (ITU)** set the foundation by defining types of interference under ITU regulations and highlighting their risks to safety and economic activity. He outlined a multi-layered approach to mitigation, from global ITU frameworks to tailored bilateral agreements, arguing that regional solutions are often most practical. He concluded with a strong call for proactive, harmonized spectrum coordination to prevent issues before they arise, emphasizing the ITU's role in facilitating this cooperation.

**Ms. Jedtavong THEPVONGSA (Lao PDR)** reinforced the regional perspective, echoing the definitions and risks of harmful interference. Her presentation detailed the same multi-pronged mitigation strategies, from global frameworks to local agreements, and also emphasized the practicality of regional solutions. She joined the call for proactive prevention through harmonized frameworks and highlighted the essential support role of the ITU.

**Ms. Chotmony Som (Cambodia)** provided a concrete national example, explaining her country's two-tiered regulatory structure. She highlighted the critical role of the Joint Technical Committee (JTC), which holds annual meetings with neighbouring countries to resolve interference, harmonize band plans, and coordinate on services like IMT and digital television. Cambodia’s strategy relies on structured bilateral cooperation and rapid response teams for on-site monitoring, showcasing a successful model of proactive regulation.

**Mr. Farid Nakhli (ITU)** provided an overview from the CIS region, explaining the supportive role the ITU's regional office plays in assisting countries with cross-border RF interference mitigation.

**Mr. Anuar Magzumov (Kazakhstan)** presented his country's comprehensive regulatory framework, which is built on strict alignment with ITU standards. He detailed extensive bilateral coordination with all neighbouring countries and active participation in regional bodies. Kazakhstan's ambitious national plans include deploying 5G in 20 cities by 2025, achieving 99% IMT coverage in rural settlements, and modernizing its spectrum plan in line with future ITU decisions, demonstrating a forward-looking approach to spectrum management.

**Panel Discussion on International Digital Connectivity for LLDC's**

The seminar concluded with a panel discussion moderated by Mr. Dulguun Damdin-Od, focusing on the unique international connectivity challenges faced by Landlocked Developing Countries (LLDCs). The session highlighted geographical, financial, and technical barriers and explored potential solutions.

**Mr Shehryar** presented on how **Pakistan**, as a transit country, could serve as a strategic gateway. He proposed supporting low-latency submarine connectivity for CIS nations and Mongolia by facilitating access through partnerships with China, offering a potential solution to bypass traditional and often costly routes.

**Dr Otgonchimeg** from **Mobicom** **Mongolia** provided the private sector perspective, detailing their network's redundancy through multiple international hubs. Their primary challenge, however, is affordability and attracting content. They explained that major OTT platforms and LEO satellite providers are reluctant to localize servers or earth stations in Mongolia due to the country's traffic volumes falling below their minimum economic thresholds.

**Mr CHANDRA Pankaj** from **Nepal** shared their national strategy to overcome dependence on a single transit neighbour. While the southern route remains the cheapest, Nepal has established a new link through its northern neighbour to achieve critical redundancy and resilience. For last-mile connectivity in its mountainous terrain, satellite remains an indispensable technology.

**Mr. Vahan Hovsepyan** from **RIPE NCC** outlined the support their organization can provide. They emphasized assisting countries in better measuring connectivity and performing broadband traffic analytics. Based on successful interventions elsewhere, they offered to provide the necessary equipment and expertise to enable data-oriented decision-making for network development.

**Mr. Talant Sultanov**, participating remotely, emphasized that the path forward requires a multi-faceted approach. He advocated for making ICT services more affordable through innovation, localizing content to keep traffic within regions, and strengthening international cooperation. He specifically called on transit countries to support the digital development of LLDCs by providing cost-effective and redundant links to international submarine cables.

**Key Takeaways**

Following were key conclusions of the sessions

* **Satellite Technology is a Critical, Immediate Solution for LLDCs**. There is a strong consensus that Non-Terrestrial Networks (NTNs), including Low Earth Orbit (LEO) constellations and Direct-to-Device (D2D) services, are no longer just a future option but a necessary tool to overcome the geographical isolation of LLDCs. They provide a viable path to deliver affordable connectivity, vital e-services, and early warnings to remote populations, effectively ensuring that being landlocked does not mean being "opportunity locked."
* **Proactive and Harmonized Regulatory Frameworks are Essential**. A recurring theme was the urgent need for LLDCs to develop modern, enabling regulations that can keep pace with technological innovation like NGSO satellites. This includes creating clear licensing processes, updating spectrum management policies to prevent cross-border interference, and establishing standards (like mandating Cell Broadcast for national alert systems) to foster a competitive environment that balances innovation, security, and fair competition.
* **Resilience Requires a Multi-Layered, Hybrid Approach to Connectivity**. LLDCs cannot rely on a single technology. The workshop concluded that resilience is best achieved through integrated hybrid networks that combine terrestrial fiber, mobile networks, and diverse satellite solutions. This approach ensures redundancy if one system fails (e.g., during a disaster) and helps discipline prices for international bandwidth, making connectivity more affordable and stable.
* **Regional and international Cooperation.** To mitigate their disadvantage of relying on transit neighbours, LLDCs must act collectively. The workshop highlighted the power of negotiating as a bloc through regional organizations (like the Asia-Pacific Telecommunity) to secure better terms for transit, harmonize regulations, share best practices, and develop joint infrastructure projects like regional Internet Exchange Points (IXPs) to localize content and reduce costs.
* **Building Local Capacity and Localizing Content is Fundamental for Sustainable Development**. Beyond infrastructure, long-term digital inclusion depends on developing local skills and creating a reason to be online. This involves investing in capacity-building programs to create a skilled workforce and implementing strategies to host local content and data within the country or region. This reduces dependency on expensive international bandwidth for foreign content and makes digital ecosystems more relevant and sustainable for local populations.

**Event feedback**

An online feedback form was developed to collect participants’ evaluations of the workshop. The responses were overwhelmingly positive, with more than 90 percent indicating that they were satisfied with the content and delivery, and that the workshop met its stated objectives. This evaluation provides essential insights for future improvements, refining planning, enhancing content, and defining the scope of future similar events.

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| What other topics should be considered in future events? |
| More about space connectivity and Public private partnership in space sector |
| Focus on WRC standards |
| All technologies used for every warning system. |
| Spectrum Pricing/Auction |
| Use of satellite in early warning system |
| Sustainability of RF resource, NTN |
| Satellite Frequency coordination, Integration of TN and NTN |
| How to regulate future trends technology such as 5G/6G, IoT and IXP, MIX etc. |
| Regulatory framework best practices for new technology particularly for satellite services |
| Regional digital infrastructure development such as IXP, DC etc |
| DIGITAL INCLUSION |
| Amateurs service |
| Spectrum Harmonization & RF Planning for Neighbouring Countries. |
| CYBER SECURITY AND SUSTAINABLE ICT |

**Conclusion and Outcome**

The event reinforced the critical role of adopting enabling environment to better leverage the emerging technologies and enhance international cooperation in overcoming the unique digital development challenges faced by Landlocked Developing Countries (LLDCs). The event brought together **over 50 Participants from over 20 countries** and facilitated as a exchange between, private sector, regulators, policy makers, international organizations, and development agencies.

Key takeaways from sessions focused on practical solutions, including strategies for improving digital infrastructure, adopting hybrid connectivity models, and developing the necessary policy and regulatory frameworks.

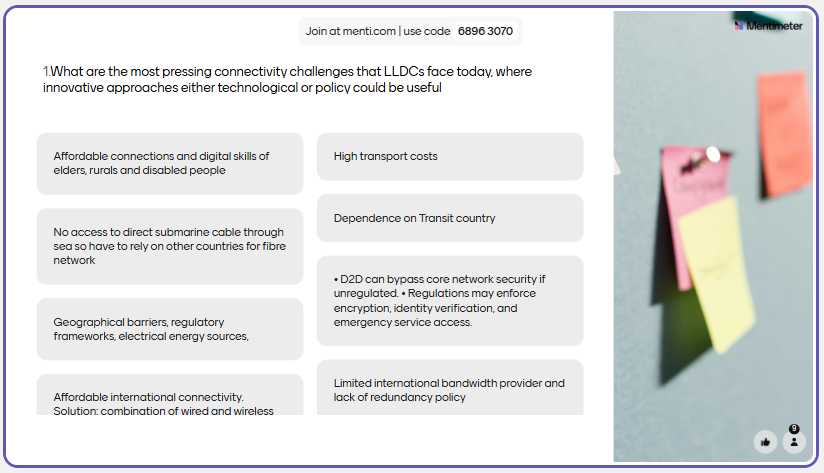
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**Annexures**

1. **List of participants**



1. **Mentimeter feedback from innovation Cafe**



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