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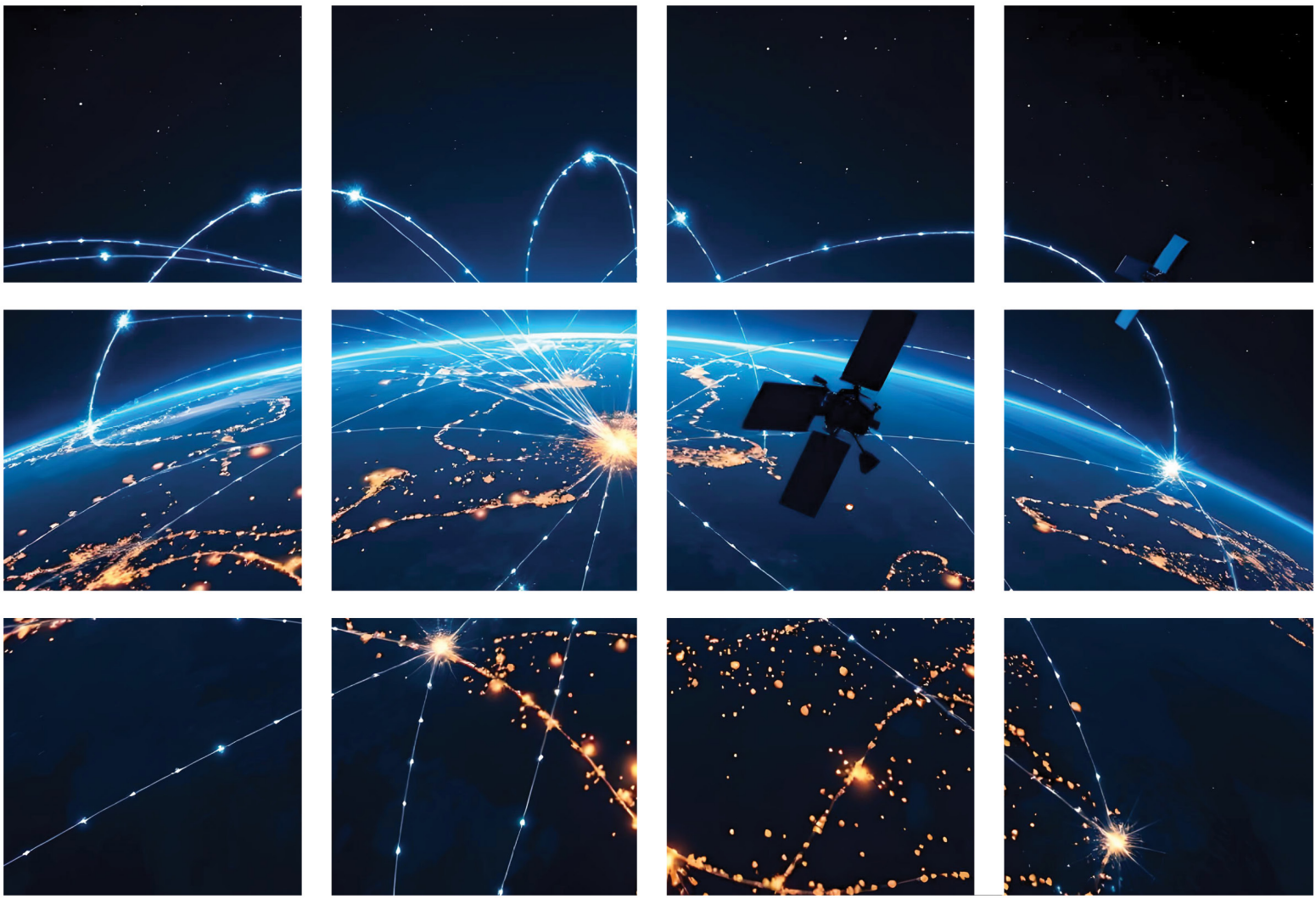
Non-geostationary satellite orbit (NGSO) licensing framework toolkit

Topics, approaches, and trade-offs for national NGSO licensing frameworks



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Foreword

Satellite connectivity is a critical component of efforts to achieve resilient, universal and meaningful connectivity. Satellite systems complement terrestrial fixed and mobile networks by extending broadband connectivity to remote and underserved communities, network availability resilience, supporting emergency communications and enabling new digital services. These developments create significant opportunities for countries seeking to close connectivity gaps and expand access to digital services.

At the same time, the rapid evolution of non-geostationary satellite orbit (NGSO) systems—particularly low earth orbit constellations, direct-to-device services and increasingly global service models—is reshaping the satellite market and placing new demands on national regulatory frameworks. Incremental adjustments may no longer be sufficient where the scale, speed and diversity of licensing requests require more structured and forward-looking regulatory responses.

This toolkit has been developed to support policy-makers and regulators as they handle the licensing of NGSO systems (assessments, reviews, updating, and developing of licensing approaches). It provides practical guidance on the main regulatory choices and implementation considerations associated with market access, spectrum use, gateway and earth station authorization, user terminals, service provision and emerging applications. Its purpose is not to prescribe a single model, but to help decision-makers assess the options available to them and identify approaches that are proportionate, predictable and adapted to national circumstances.

It is my hope that the approaches presented in this toolkit will serve as practical starting points for regulatory reflection and framework design. In coming up with this toolkit we took into consideration that there is no one-size-fits-all solution: each country will need to consider its policy objectives, market conditions, institutional capacity, spectrum environment and connectivity needs. By bringing together emerging practices, policy considerations and practical trade-offs, this toolkit aims to assist regulators and policy-makers in developing licensing frameworks that support innovation, investment and inclusive connectivity while ensuring that NGSO satellite services are introduced in a safe, sustainable and well-governed manner.

Dr Cosmas Luckyson Zavazava
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Executive summary

The regulatory moment

Satellite licensing frameworks in many countries were based on the premise that bandwidth from space would remain scarce, expensive, and delivered by a small number of geostationary satellite orbit (GSO) systems. However, non-geostationary satellite orbit (NGSO) systems—and low Earth orbit (LEO) constellations in particular—have made this premise obsolete. Constellations of hundreds or thousands of satellites now deliver low-latency broadband to every geography; user terminals have become consumer electronics; and operators combine orbits, spectrum bands, and service models. A review of existing regulatory frameworks on licensing has become necessary.

Three forces are pushing regulators to act. The first is that demand for new connectivity solutions is rising as national policy agendas seek to address rural broadband targets, network resilience after disasters, and the integration of satellites into universal-service strategies. The second is expanded supply as LEO deployment accelerates, with new offerings—notably direct-to-device (D2D) services and satellite integration with networks operated by mobile network operators (MNO)—falling outside existing rules. The third force is an acceleration in policy cycles: the agenda for the World Radiocommunication Conference (WRC) 2027, outputs from ITU Radiocommunication Sector (ITU-R) study groups, and regional decisions made within the Inter-American Telecommunication Commission (CITEL), the African Telecommunications Union (ATU), the Association of Southeast Asian Nations (ASEAN), the West Africa Telecommunications Regulators Assembly (WATRA), and the European Conference of Postal and Telecommunications Administrations (CEPT) have set timetables for their corresponding implementation at the national level. D2D is the canary use case, as it evokes nearly every difficult licensing question at once: spectrum coexistence with terrestrial mobile, MNO partnerships, lawful interception (LI) in motion, type approval of consumer handsets, and the treatment of hybrid services within the parameters of universal service obligations (USO).

International foundations and authorizations

Every NGSO system that reaches service passes through the ITU coordination chain, moving from advance publication information through coordination under Article 9 and notification under Article 11 of the Radio Regulations, to its recording in the Master International Frequency Register (MIFR), with the deadlines for bringing the system into use attached to a seven-year window. While these filings are managed by regulatory bodies, services are delivered by licensed entities, so domestic licences are the vehicle through which an ITU filing is translated into commercial activity in the country. The most under-resourced step in many administrations is transposition, i.e. keeping the national table of frequency allocations up to date after each WRC, maintaining a working relationship with the ITU-R, and turning international outcomes into licence conditions.

The authorizations an NGSO operator must hold fall into two tiers. In the first, a single home country space-station licence establishes the constellation itself, determines the ITU filing, and incorporates the long-term debris and interference duties. In the second, host-country

authorizations govern entry into each national market. These typically include a grant of market access (e.g. landing rights); a spectrum licence or assignment; earth-station or gateway licences for in-country facilities; the authorization of user terminals; the authorization of earth stations in motion (ESIM); and, in cases when operators retail directly to subscribers, a service licence. Institutional arrangements vary widely, with some countries having one regulator responsible for overseeing everything and others splitting their spectrum management, licensing, and space-agency functions across several bodies, in which case coordination among those bodies is itself a question of framework design.

Thirty-two licensing issues, and their approaches and trade-offs

The toolkit outlines 32 licensing issues divided into eight categories. Each issue is presented in three parts: the issue, the approaches available (each derived from actual regulatory practice or recommendations by regional bodies, with country examples) and the trade-offs among them. Each issue stands alone, so regulators can consult any one of them directly.

Legal and procedural foundation (issues one to five). These issues concern whether existing law considers NGSO operations at all, whether the several applications required should be filed together or in sequence, what is published for comment, how long licences last, and whether a trial pathway exists. Practice in many jurisdictions is converging on technology-neutral legal authority, bundled or closely coordinated filings, medium-length licence terms with conditional renewal, and trial or sandbox frameworks that allow regulators to observe novel offerings before adopting permanent rules. Other jurisdictions maintain satellite-specific statutes, sequential filings, or different licensing terms, and the toolkit recognizes these as defensible choices when they fit domestic legal traditions and market conditions.

Market access architecture (issues six to eight). Regulators must decide what local presence to require of foreign-headquartered operators, which roles in the NGSO value chain require licences, and whether market entry requires granting access to each system or automatically recognizing the approval of other authorities. Local incorporation with a local representative, role-differentiated licensing with a light touch upstream, and per-system landing rights with deferred technical reviews are common middle paths, although stricter local-presence requirements or more detailed upfront technical reviews may better serve countries with different policy priorities.

Spectrum management (issues nine to 11). The toolkit examines how MIFR registration and first-in-line rights interact with national assignments, whether the national table of allocations accommodates the Ka, Ku, V, and E bands for fixed-satellite service (FSS) and the L, S, and Ka bands for mobile-satellite service (MSS), and how spectrum fees are structured. Each model has its trade-offs when it comes to fees, as charging cost-recovery administrative fees maintains barriers to entry and keeps prices for end users low. However, doing so forgoes potential fiscal revenue from spectrum use with the costs that tend to be passed through to end users. Per-terminal fees are simple to administer, but the brunt of them falls mostly on operators that extend coverage furthest. Auction or economic-rent models are well established for terrestrial mobile networks, but they transfer less readily to NGSO supply economics.

Equipment licensing (issues 12 to 16). Countries can ease many of the administrative bottlenecks that scale with subscriber numbers by recognizing international type approvals, treating terminals as ordinary consumer electronics for customs purposes, issuing unified site-level gateway licences with published exclusion zones, extending ESIM authorization from the blanket

terminal licence, and providing blanket authorization of technically identical user terminals. Customs and tax treatment is among the stronger affordability levers a government controls, and the choice between issuing blanket or individual licences for terminals bears directly on whether mass-market satellite broadband can scale, although individual authorization may still be preferred where closer oversight of terminal deployment is a priority.

New service models and technologies (issues 17 to 20). D2D can be authorized under existing frameworks through MSS spectrum or through the modification of terrestrial international mobile telecommunications (IMT) licences for supplemental coverage from space (SCS), although some administrations may prefer to await the outcomes of WRC-27. Satellite backhaul for mobile networks can rely on existing MNO licences, and the Internet of Things (IoT) and other specialized services may benefit from a light touch in places where the existing definitions of telecommunication services prove ill-fitting. Multi-orbit, software-defined systems can be licensed as integrated networks or orbit by orbit, the trade-offs of which are detailed in this toolkit.

National security and sovereignty (issues 21 to 23). The toolkit sets out options for a national security review of ownership and control, cybersecurity standards, and LI. Risk-based screenings, certifications against international standards, and objective-based intercept obligations that permit technology-neutral compliance offer scalable positions for regulators with limited standing capacity, while more prescriptive or platform-based approaches increase depth and control at the cost of speed and, in some cases, civil liberties.

Data, subscribers, and network oversight (issues 24 to 27). The more widely observed practices include the targeted localization of specific data categories, operator-managed know your customer (KYC) verification with audit rights, periodic structured reporting through an online portal, and the application of a standard interconnection framework. However, approaches tend to vary depending on a country's national data-protection and security frameworks.

Consumer protection, universal service, and disaster response (issues 28 to 32). Disclosure-based quality-of-service (QoS) regimes with NGSO-specific metrics can protect consumers from misrepresentation while respecting the technical characteristics of satellite services. Locally routing emergency calls is increasingly treated as essential, particularly for D2D. Regarding universal service, best practices increasingly favour full participation by operators, with contributions to a universal service fund (USF) and eligibility for disbursements. Competitive reverse auctions are often cited as an efficient allocation mechanism, though direct designation and other mechanisms remain in use. Standing emergency-authorization pathways, established before disasters occur, complete the framework.

Cross-cutting themes and pragmatic starting points

Three threads run through nearly every issue. The first is speed to market versus the thoroughness of domestic review. Although every additional filing, hearing, or independent technical assessment increase transparency and trust, they can delay service to the communities that satellite systems are often best placed to reach first. The second is leverage versus control. Regulators can rely on ITU processes, the findings of home administrations, and international type approvals, reserving national efforts for national concerns, or they can instead duplicate those processes domestically at a significant cost in staff and time. The third thread is revenue versus affordability. Fees that treat NGSO systems as a revenue opportunity are ultimately paid by end users and can price the service out of the very markets they aim to serve.

For most regulators, which are not home administrations for any NGSO system, pragmatic starting points emerge. These include:

- technology-neutral legal authority rather than bespoke satellite statutes;
- a bundled or closely coordinated application architecture;
- conditional reliance on reviews by the home administration, combined with domestic security and market screenings;
- blanket authorization of user terminals;
- cost-oriented administrative fees, at least while the market develops; and
- standing pathways for trials, experiments, and emergency deployments.

The countries used as examples throughout the guide have shown deliberate, defensible departures from each of these, and the right choices for a country depend on its market structure, institutional capacity, and policy objectives.

Capacity is a constraint on many administrations, and any framework should be designed around this reality. The limited technical staff of domestic bodies is best focused on gating decisions (e.g. legal authority, market access, and spectrum and terminal authorization), with recognition, deference, and regional cooperation doing the work elsewhere. The framework should also be built to adapt, as WRC-27 will consider the limits on equivalent power-flux density (EPFD) and discuss spectrum for D2D services. Multi-orbit and software-defined systems are blurring the lines between traditional licence categories, and regional bodies are developing shared approaches. Review clauses, sandbox mechanisms, and periodic consultations let frameworks absorb these developments without rewriting them entirely.

The purpose throughout remains connectivity. NGSO systems help serve unconnected and underserved communities, remote islands, and disaster-affected areas. A licensing framework that is clear, proportionate, and oriented around international practices can convert orbital capacity into national coverage, providing the test against which every choice in this guide should be measured.

List of acronyms

Acronym	Complete term
3GPP	3rd Generation Partnership Project
5G	Fifth-generation mobile networks
ACMA	Australian Communications and Media Authority (Australia)
ANATEL	Agência Nacional de Telecomunicações (National Telecommunication Agency, Federative Republic of Brazil)
API	Application programming interface
ARCEP	Autorité de Régulation des Communications Électroniques et de la Poste (Regulatory Authority for Electronic Communications and Postal Services, Republic of Benin)
ASEAN	Association of Southeast Asian Nations
ATU	African Telecommunications Union
CAD	Canadian dollar
CALEA	Communications Assistance for Law Enforcement Act (United States of America)
CEPT	European Conference of Postal and Telecommunications Administrations
CITEL	Comisión Interamericana de Telecomunicaciones (Inter-American Telecommunication Commission)
CNES	Centre National d'Études Spatiales (National Centre for Space Studies, France)
CPC	Client Procedures Circular (ISED, Canada)
CRASA	Communications Regulators' Association of Southern Africa
CRT	Comisión Reguladora de Telecomunicaciones (Telecommunication Regulatory Commission, Mexico)
CST	Communications, Space and Technology Commission (Kingdom of Saudi Arabia)
D2D	Direct-to-device
DSIT	Department for Science, Innovation and Technology (United Kingdom of Great Britain and Northern Ireland)
EPFD	Equivalent power-flux density
ESIM	Earth stations in motion
ETSI	European Telecommunication Standards Institute
EU	European Union
FAA	Federal Aviation Administration (United States)
FCC	Federal Communications Commission (United States)

(continued)

Acronym	Complete term
FSS	Fixed-satellite service
GEO	Geostationary Earth orbit
GHz	Gigahertz
GSMA	GSM Association
GSO	Geostationary satellite orbit
ICAO	International Civil Aviation Organization
ICT	Information and communication technology
IEC	International Electrotechnical Commission
IFT	Instituto Federal de Telecomunicaciones (Federal Telecommunications Institute, Mexico)
IMO	International Maritime Organization
IMT	International mobile telecommunications
InTi	Infrastructure Provider for the Telecommunication Industry licence (Brunei Darussalam)
IoT	Internet of Things
IP	Internet protocol
ISAC	Information Sharing and Analysis Centre (as in Space ISAC and EU ISAC)
ISED	Innovation, Science and Economic Development Canada
ISL	Inter-satellite link
ISO	International Organization for Standardization
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
KYC	Know your customer
LEO	Low Earth orbit
LI	Lawful interception
MCMC	Malaysian Communications and Multimedia Commission (Malaysia)
MEO	Medium Earth orbit
MHz	megahertz
MIFR	Master International Frequency Register
MinTIC	Ministerio de Tecnologías de la Información y las Comunicaciones (Ministry of Information Technologies and Communications, Republic of Colombia)

(continued)

Acronym	Complete term
MNO	Mobile network operator
MoU	Memorandum of understanding
MRA	Mutual recognition agreement
MSS	Mobile-satellite service
NASA	National Aeronautics and Space Administration (United States)
NatCA	National Communications Authority (Sierra Leone)
NATCOM	National Telecommunications Commission (Sierra Leone; renamed NatCA)
NBTC	National Broadcasting and Telecommunications Commission (Thailand)
NCC	Nigerian Communications Commission (Nigeria)
NETP	National emergency telecommunication plan
NFP	Network Facilities Provider (licence category, Malaysia)
NGSO	Non-geostationary satellite orbit
NIS	Network and Information Systems (Regulations 2018, United Kingdom)
NIS2	Second Network and Information Security Directive (EU Directive 2022/2555)
NIST	National Institute of Standards and Technology (United States)
NOAA	National Oceanic and Atmospheric Administration (United States)
NSP	Network Service Provider (licence category, Malaysia)
NTN	Non-terrestrial network
Ofcom	Office of Communications (United Kingdom)
PCC.II	Permanent Consultative Committee II: Radiocommunications (CITEL)
PFD	Power-flux density
QoS	Quality of service
RALI	Radiocommunications assignment and licensing instructions (ACMA)
RRB	Radio Regulations Board (ITU)
SCS	Supplemental coverage from space
SESN	Satellite Earth Station Network (licence category, Ghana)
SeTi	Service Provider for the Telecommunication Industry licence (Brunei Darussalam)
SI	Statutory instrument (United Kingdom)
SLL	Sierra Leone Leone
SMS	Short message service

(continued)

Acronym	Complete term
SUBTEL	Subsecretaría de Telecomunicaciones (Undersecretariat of Telecommunications, Chile)
TED	Trial, Experiment and Demonstration guidelines (MCMC)
USC	United States Code
USD	United States dollar
USF	Universal service fund
USO	Universal service obligation
VSAT	Very small aperture terminal
WATRA	West Africa Telecommunications Regulators Assembly
WRC	World Radiocommunication Conference (WRC-23 and WRC-27 denote the 2023 and 2027 conferences)
WTO	World Trade Organization

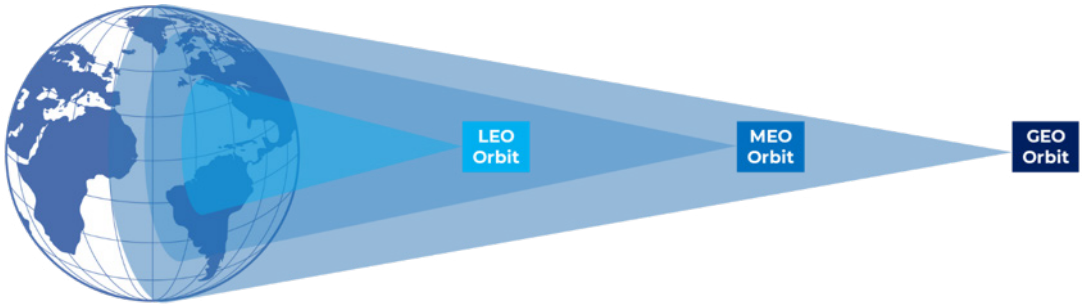
Chapter 1. The NGSO and LEO regulatory moment

1.1 What has changed

The deployment of LEO constellations, the emergence of D2D services, and closer integration between satellite operators and mobile network operator (MNOs) are expanding the range of connectivity solutions and services in ways that existing licensing frameworks may not have been designed to accommodate. This in turn is forcing regulators around the world to review their existing satellite licensing frameworks.

Innovations in satellite systems, launch vehicles, and connectivity technologies are changing the dynamics for connecting hard-to-reach places, including remote islands and offshore locations. In the same way that submarine cables have rewritten landing-point economics, NGSO systems—and LEO constellations in particular—are expanding the supply of broadband capacity for all geographies, and governments are facing greater pressure to address the increasing number of new market participants.

Figure 1: Comparison of orbital altitudes and characteristics



Source: Satellitetoday.com (2025)

Note: Illustrative; not to scale.

Table 1: GEO, MEO, and LEO orbital characteristics

	GEO	MEO	LEO
Altitude	35 800 km	8 000 to 20 000 km	400 to 2 000 km
Orbital period	24 hours	Four to 12 hours	One to two hours
Footprint	Large	Medium	Small
Satellite cost	High	Medium	Low
Satellite lifetime	Long	Long	Short
Latency	Medium (~700 ms)	Low (~150 ms)	Very low (~50 ms)
Satellites required*	3	6 to 24	Hundreds

Table 1: GEO, MEO, and LEO orbital characteristics (continued)

	GEO	MEO	LEO
Gateways	Few and fixed	Regional and flexible	Local and numerous (assuming no usage of inter-satellite links)
Antenna	Stationary	One-hour slow tracking	Ten-minute fast tracking

Source: ITU

* For simultaneous global coverage.

Satellite licensing frameworks now require structural changes, as incremental adjustments are failing to keep pace with the volume of licensing requests and the rapid pace of technological advancement. Single-operator geostationary satellite orbit (GSO) licensing has given way to mega-constellations, multi-orbit fleets, and multi-service operators. Spectrum bands of regulatory interest now span the L, S, C, Ku, Ka, Q, and V bands. Optical links are also being utilized more frequently within satellite constellations. Beam-hopping, dynamic spectrum management, and software-defined satellites have made regulatory toolkits – designed for fixed-beam GSO and one-off installations of very small aperture terminals (VSATs) – inadequate for the constellation-based, latency-sensitive, and cross-jurisdictional realities of NGSO architectures and services.

1.2 Why national regulators are revisiting frameworks now

Three forces are pushing regulators to act at the same time. The first is rising demand for new connectivity solutions, with national policy agendas showing a growing interest in rural broadband targets, network resilience after natural disasters, connectivity for the public sector, and the integration of satellites into universal-service strategies. The second is the increased amount of bandwidth from new systems and services. Rapid LEO deployment, the launch of new D2D offerings, and the integration of satellite and MNO networks are creating service offerings that the existing rules do not cover.[1] The third force is the acceleration in the policy cycle. The WRC-27 cycle, outputs from ITU Radiocommunication Sector (ITU-R) study groups, and decisions by regional bodies (e.g. CITEL, ATU, ASEAN, WATRA, and CEPT) are establishing timetables for making regional decisions that will require implementation by domestic administrations.

Licensing approaches are trending towards combining several authorizations (e.g. landing rights, service licence, ground-segment licence, and spectrum authorization), although with significant variations in detail. Frameworks are becoming more technology-neutral and orbit-neutral, with carve-outs only where coexistence requires it. One-stop-shop regulators and inter-agency committees coordinating space, spectrum, information and communication technology (ICT), and cybersecurity are emerging. Regulatory sandboxes, trusted-operator lists, and fast-track approval processes for established operators are being utilized more, and regional bodies that harmonize different approaches and reciprocity arrangements are becoming increasingly significant. Space is also becoming part of the mandate of national regulators, with national space agencies being established and regional bodies taking shape (e.g. the African Space Agency), raising fresh questions about coordinating on spectrum, licensing, and security.

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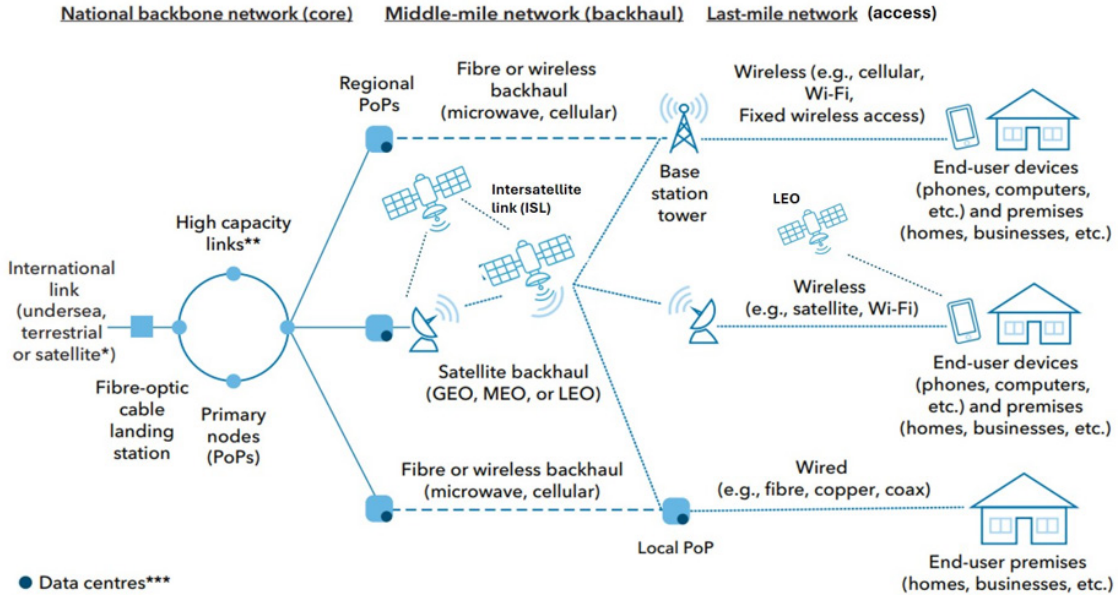
1 Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (March 2026); ATU, *ATU-R Report 006-0: Developments in Satellite Communications* (June 2025).

Figure 2: Internet infrastructure architecture



Source: Adapted from ITU, *The Last-Mile Internet Connectivity Solutions Guide: Sustainable Connectivity Options for Unconnected Sites* (2020).

Note: PoP: Point of presence.

Box 1: Direct-to-device as the canary use case

Direct-to-device (D2D) satellite services are evoking every difficult licensing issue at once: cross-border roaming, spectrum coexistence with terrestrial IMT, MNO partnerships (including spectrum sharing), LI in motion, type approval of consumer handsets, and the treatment of hybrid services within USOs. D2D services are affected by most of the topics noted in Chapter 3, including spectrum, equipment licensing, and consumer protection.

D2D represents a fundamental shift in telecommunication architecture, enabling smartphones and other mobile devices to communicate directly with satellites without requiring specialized hardware or depending on ground infrastructure. This technology leverages LEO satellite constellations that directly connect to devices (handsets and others), deploying two complementary spectrum approaches: D2D-MSS, which utilizes dedicated MSS spectrum with 3rd Generation Partnership Project (3GPP) non-terrestrial network (NTN) standardization for globally harmonized coverage; and D2D-IMT, which operates on a secondary, no-interference basis within terrestrial IMT spectrum through operator partnerships, an approach that is in line with WRC-27 Agenda Item 1.13.[1]

The issues presented by D2D services and how regulators can address them will be expanded on in Chapter 3.

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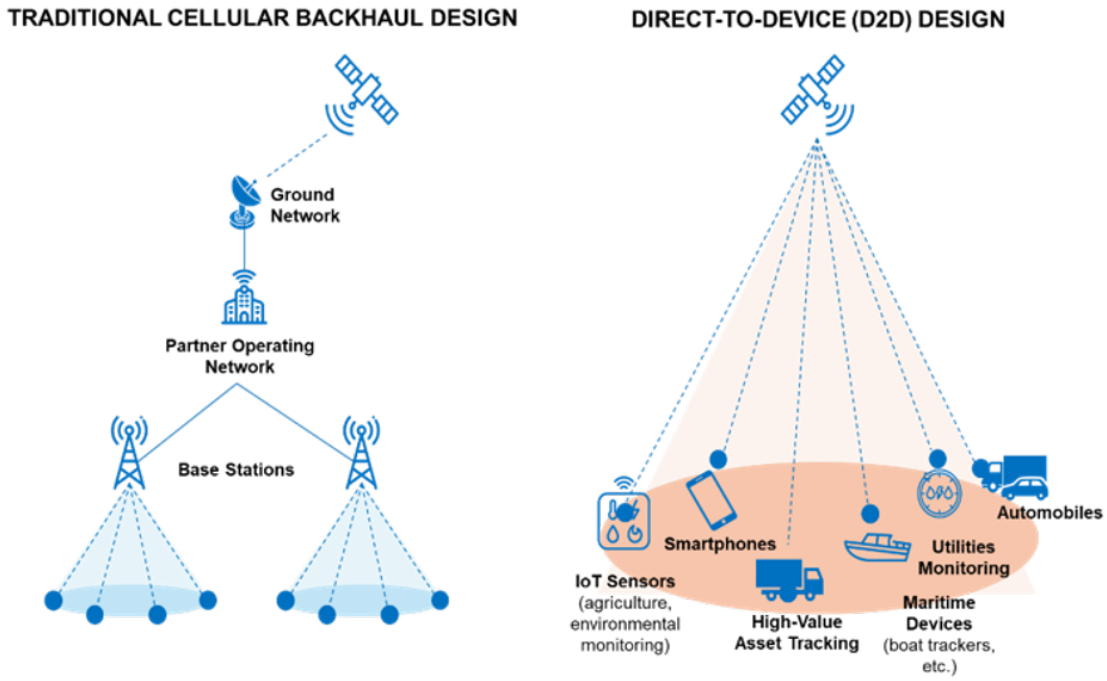
[1] Digital Regulation Platform, "Satellite Direct-to-Device Services" (April 2025); GSMA, "3GPP overview of Non-Terrestrial Networks (NTN)" (July 2024); and Krause, Joern, "Non-Terrestrial Networks (NTN)" (updated July 2025).

Figure 3: Path differences in direct-to-device connectivity



Source: Adapted from Ericsson (2025), Ground Control (2025), and Telefónica (2024).

Chapter 2. Foundations: The international arena, regulators, and primary authorizations

2.1 Why the role of regulators has changed

Regulating NGSO systems calls for a markedly different approach than authorizing terrestrial mobile services, GSO networks, or fixed land-based infrastructure. Such constellations normally share spectrum on a non-exclusive footing after completing a lengthy, multi-year coordination exercise at ITU.

Several constellations can deliver broadband concurrently over the same shared bands, coexisting with each other, established GSO operators, and other licensees. That coexistence flows from the intensive coordination work that operators, administrations, and ITU complete before any system is cleared to launch and enter service.

Decisions on review timelines and administrative processes impact competition and the pace at which new services consumers. Where appropriate, administrations can rely on the engineering and operating assessments already conducted and cleared by other authorities.

2.2 The filing and coordination chain

Every NGSO system that reaches service must pass through the ITU-R coordination chain, beginning with the submission of advance publication information or a coordination request under Article 9 of the Radio Regulations, then notification under Article 11 of the Radio Regulations, and finally its recording in the MIFR.[2] The rules on bringing the system into use, along with the seven-year window between the ITU-R receiving the filing and the service launching, determine the regulatory milestones and establish how filings can be suspended or revoked for non-use. The implications for national licensing are clear: filings are managed by governments and services by licensed entities, so domestic licences issued by regulators are the vehicle through which ITU filings are translated into commercial activity. To limit the extensive non-use of filings, ITU has been imposing deadlines for operators to launch and operate satellites, and working to reduce the number of filings that are not followed by actual deployment.

2.3 Radio Regulations articles most relevant to NGSO and LEO licensing

Numerous articles in the ITU Radio Regulations recur in NGSO licensing analyses. For example, Article 5 contains frequency allocations and the primary or secondary status of each service in each Region. Article 9 sets out advance publication information and the procedure for coordination, Article 11 establishes the notification and recording of frequency assignments, and Article 21 governs sharing with terrestrial services. Article 22 establishes EPFD limits to

[2] ITU, *Radio Regulations: Articles* (2024).

protect GSO services from NGSO interference (Box 2). Beyond the Radio Regulations, Article 44 of the ITU Constitution governs the allocation and registration of frequency bands and orbital positions, emphasizing rational, efficient, and economical use, and ensuring equitable access. Article 45 of the ITU Constitution mandates the prevention of harmful interference, requiring operational compliance and international coordination.

Box 2: WRC-27

The agenda for WRC-27 includes several items on the provision of more spectrum for fixed or mobile connectivity (1.2, 1.3, and 1.4, and 1.1, 1.11, 1.12, 1.13, and 1.14, respectively). WRC-27 will moreover consider improvements to the regulatory and technical conditions for satellite systems to gain access to radio spectrum (agenda items 1.5, 1.6, and 7). In addition, WRC-23 invited ITU-R to study the EPFD limits in Article 22 and report the results to WRC-27, without regulatory consequences at WRC-27 itself.

2.4 Translating ITU outcomes into national rules

Transposition from the Radio Regulations into a national spectrum plan and licensing conditions is the most under-resourced step in many administrations. The national table of frequency allocations must be updated after each WRC; a party inside the regulator must maintain the relationship with the ITU-R; technical specifications should be operationalized in licence conditions; and participation in ITU-R study groups must feed back into licensing decisions, not merely conference outputs. Regulators remain aligned between WRC cycles through the Rules of Procedure of the Radio Regulations Board (RRB) and ITU-R Recommendations.

2.5 Required authorizations for an NGSO operator

The licences required by an NGSO operator fall into two tiers. The space-station licence, which the home administration authorizes, establishes the constellation itself; in contrast, host-country authorizations govern the entry of operators to and their conduct in each national market. Four of these are the foundational licence categories (space-station, market-access, user-terminal, and earth-station licences) but in practice operators entering a new country will need several other authorizations. The table below sets out the full range, while the subsections that follow describe each in turn. Chapter 3 examines the policy choices each one raises.

Table 2: NGSO licence authorizations

Authorization	Issued by	Vantage	What it authorizes
Space-station licences	Home administration	Home country	Establishes the constellation itself (e.g. orbital and spectrum authority, ITU filing, and long-term debris and interference duties).
Market access (landing rights)	Host regulator	Host country	Allows a foreign-licensed system to serve the national market.
Spectrum licences or assignments	Host regulator	Host country	Gives the right to use the relevant bands nationally, consistent with the table of allocations.

Table 2: NGSO licence authorizations (continued)

Authorization	Issued by	Vantage	What it authorizes
Earth-station/gateway licences	Host regulator	Host country	Establishes gateway facilities and the coordination zones around them, although these are only needed in countries where gateways are deployed.
User-terminal authorization	Host regulator	Host country	Authorizes consumer and enterprise terminals, usually under a single blanket licence.
ESIM authorization	Host regulator	Host country	Authorizes terminals on ships, aircraft, and vehicles transiting the territory.
Service licence (telecommunications or Internet access)	Host regulator	Host country	Allows for sales of telecommunication or Internet-access services directly to subscribers.

Source: Authors.

Space-station licences

A space-station licence is issued by the administrations of the countries in which operators are based (i.e. its home administration) and confers broad authority to employ designated spectrum for the uplinks and downlinks running between the satellites and their terminals. Under the ITU Constitution and Convention and the Radio Regulations, such a licence undergoes processing by ITU and is granted by the responsible home administration. Since only sovereign administrations can bring filings before ITU, the authority in the home country is pivotal, and it is responsible for debris, interference, and similar long-term duties (issue nine).

Market access (landing rights)

Even when operators already hold a space-station licence issued abroad, the receiving administration still must authorize commercial entry into its market. Often labelled as landing rights, these authorizations are the filings that administrations encounter most frequently, establishing the operating rules for the constellation. Its term is usually long, for example around 15 years (issue eight).

Earth-station/gateway licences

Earth-station licences cover ground gateway facilities. These are the major nodes that link a satellite network to the terrestrial Internet, to cloud and data-centre resources, and to private networks. They also offer telemetry, tracking, and control. Earth stations operate at higher power and capacity than user terminals and typically require coordination zones around their locations. Not all countries host gateways, as it comes down to network design and national regulations. Gateways tend to be located near major Internet interconnection points and data-centre clusters (issue 14).

User-terminal authorization

User-terminal licences cover the devices through which households and enterprises reach satellites. These terminals increasingly resemble ordinary consumer electronics, particularly for LEO terminals. They are compact, mobile, simple to set up, and built for high-volume retail. This is driving a strong shift toward the blanket authorization of identical user terminals rather than the legacy practice of site-specific authorization (issue 16).

Spectrum licences or assignments

Whatever the service, operators need to have the right to use the relevant frequencies in the country. A spectrum licence or assignment confirms that the bands the system proposes—usually within the Ka, Ku, and, increasingly, V and E ranges—sit within the national table of allocations and are subject to any conditions attached to them. In some jurisdictions, this is folded into the granting of market access, while in others it is issued as a separate instrument (issues nine to 11).

Earth stations in motion

Terminals mounted on ships, aircraft, vehicles, and trains that operate while moving across a country's territory or waters are authorized separately from fixed-user terminals. Because they cross borders, authorizations for ESIM raise distinct registration and enforcement questions, and they matter commercially in shipping and aviation markets (issue 15).

Service and operating licences

When operators sell a retail service directly to subscribers rather than wholesale to a locally licensed provider, they generally need the same service or carrier licence any provider would have. Whether this layer applies depends on the business model and also on how local law defines the relevant service categories. Regulators can allow these applications to be filed together rather than in sequence (issue two), and they can leave operators latitude in how they package, promote, and retail their offerings, including consumer-direct, wholesale, government, Internet of Things (IoT), and partnership models (issue seven).

Institutional responsibility for granting these authorizations varies depending on the country's regulatory system. In many jurisdictions, a converged ICT regulator such as the Federal Communications Commission (FCC) in the United States, the Office of Communications (Ofcom) in the United Kingdom, the Australian Communications and Media Authority (ACMA), the Communications, Space and Technology Commission (CST) in Saudi Arabia, and the National Telecommunication Agency (ANATEL) in Brazil issues a full set of authorizations (e.g. market-access, space-station, spectrum, earth-station, and service licences). Elsewhere the functions are split, with government ministries or a separate agency overseeing spectrum management. This is the case in Canada, where Innovation, Science and Economic Development Canada (ISED) licenses spectrum and approves foreign satellites for use, as well as in Chile, where the Ministry of Transport and Telecommunications grants concessions by supreme decree through the Undersecretariat of Telecommunications (SUBTEL).

The body that grants licences normally works alongside or serves as the notifying administration responsible for the country's satellite network filings with ITU. Where a national space agency or dedicated space regulator exists, the authorization of activities in the space segment (e.g. launches and in-orbit operations, including debris mitigation) typically proceeds on a separate

track that must be coordinated with the responsible licensing authority. This is done in the United Kingdom by the Civil Aviation Authority, which licenses orbital operations under the Space Industry Act 2018 and Outer Space Act 1986, while Ofcom grants the associated spectrum licences. In the United States, the Space Bureau of the FCC coordinates with the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the Federal Aviation Administration (FAA) on space-related authorizations. Countries without a space agency can establish consultation arrangements between regulators and the ministries responsible for space policy so that licensing decisions reflect the national space strategy and orbital-sustainability commitments.[3]

[3] ITU, "Regulation of satellite systems" (updated February 2022); Gov.uk, "Operating an orbital space object: rules and regulations" (updated July 2026); and FCC, "Space" (July 2026). For Canada and Chile, see the ISED CPCs and the SUBTEL framework in Appendix A.

Chapter 3. Licensing issues, approaches, and trade-offs

This section features 32 licensing issues that regulators are likely to face, ranging from legal authority and market access to spectrum, security, consumer protection, and orbital sustainability. This part of the report will present the issues themselves, the approaches available, and the trade-offs among those approaches. The issues are divided into eight categories:

- legal and procedural foundations;
- market access;
- spectrum management;
- equipment licensing;
- new service models and technologies;
- national security and sovereignty;
- data, subscribers, and network oversight; and
- consumer protection, universal service, and disaster response.

The categories are for navigation only, as most decisions in any one section have direct implications for decisions in others. It is best to review the checklist in section 3.9 as a whole.

Each issue stands alone so that regulators can open any of them without reading those before it. The various approaches are labelled as A, B, and C (and occasionally D), but every approach has been used in practice by a regulator or has been proposed by regional bodies. However, these are non-exhaustive, and administrations may develop alternatives or combine several different approaches. The sections on trade-offs note how the approaches differ and describe the potential consequences of each.

3.1 Legal and procedural foundations

Issue 1. Legal authority and statutory framework

Before granting any authorization for a non-geostationary satellite orbit (NGSO) system, regulators must confirm that they have the authority to award space-station licences, grant market access, and license earth stations, user terminals, and spectrum for non-geostationary systems. Many existing telecommunication acts and decrees were written with a focus on legacy geostationary satellite orbit (GSO) and terrestrial technologies, and they may not explicitly cover NGSO operations, blanket licensing, or cross-border constellation services.

Approaches

Approach A: Rely on the technology-neutral telecommunication laws already in place. This means subjecting NGSO operators to a generic telecommunication-service licensing regime, while leaving technical matters to subsidiary regulations and licensing decisions. Brunei Darussalam (e.g. the Service Provider for the Telecommunication Industry [SeTi] licence and Infrastructure Provider for the Telecommunication Industry [InTi] licence) and Malaysia (e.g. Network Facilities

Provider [NFP] and Network Service Provider [NSP] licences under the Communications and Multimedia Act) use this approach.[4]

Approach B: Issue interim or temporary licences pending a bespoke framework. Countries can rely on the existing telecommunication or very small aperture terminal (VSAT) licensing authority on a provisional basis while they develop dedicated instruments for NGSO operators.

Approach C: Adopt a dedicated NGSO or satellite licensing framework. This can be accomplished by developing a stand-alone instrument that explicitly addresses space-station landing rights, gateways, terminals, earth stations in motion (ESIM), direct-to-device (D2D), and spectrum questions. Some examples of this approach include Ghana's framework for licensing satellites and Nigeria's guidelines for commercial satellite communications. Decision No. 2024-108 of the Regulatory Authority for Electronic Communications and Postal Services (ARCEP) in Benin specifically regulates non-terrestrial network (NTN) service providers within the framework of the country's Digital Code.[5]

Trade-offs

Approach A is the fastest path to market entry and minimizes legislative requirements, but it leaves substantive questions unanswered (e.g. blanket licensing, ESIM treatment, D2D coordination, and security obligations) and invites ad hoc decision-making. Approach B preserves market momentum while protecting regulators from issuing incomplete frameworks, but it creates legal uncertainty for operators and can be challenged if temporary measures conflict with existing legislation. Approach C is the most durable and provides the clearest expectations for the industry, but it also takes the longest amount of time to implement, potentially delaying competitive entry by 12 to 24 months and ossifying the choices being made about a rapidly evolving technology.[6]

Issue 2. Licence application architecture (bundled versus sequential filings)

An NGSO operator requires several authorizations to provide service: a grant of market access, an earth-station gateway licence, a user-terminal authorization (blanket or site-specific), potentially an ESIM authorization, a spectrum licence, and a service licence. Regulators must decide whether to require operators to apply for these as separate sequential filings, allow them to be bundled into a single proceeding, or use a hybrid approach that combines the technical filings while reviewing the commercial licence separately.

Approaches

Approach A: A fully bundled single filing. This permits operators to submit one comprehensive application that covers all required authorizations, with the application processed in a single proceeding with a single public notice and a unified record. The Inter-American

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4 Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026); CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

5 WATRA, *WATRA NGSO Framework* (June 2024); National Communications Authority, *Satellite Licensing Framework in Ghana* (2024); NCC, *Commercial Satellite Communications Guidelines* (November 2018); and ARCEP, Decision No. 2024-108 (April 2024).

6 CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025); Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026).

Telecommunication Commission (CITEL) recommends this approach in the form of a single window for licence applications with an online platform, digital signatures, and predictable approval times established by law.[7]

Approach B: Sequential filings. This requires operators to apply for each licence separately and for them to be processed in a series, an approach similar to the rules for one-off VSAT installations. Ghana's current system has distinct application forms and fees to receive Satellite Earth Station Network (SESN) licences, as well as for landing rights and gateways.[8]

Approach C: A hybrid system, such as one that bundles technical filings into a single application (e.g. gateway, terminal, and spectrum licences) while retaining a separate process for authorizing telecommunication services or market access. The Nigerian Communications Commission (NCC) framework, which has separate forms for space-station landing permits and each ground-segment authorization but imposes a coordinated review, is representative of this configuration.[9]

Trade-offs

Bundling licence applications substantially reduces service time, avoids duplicate fee assessments, and consolidates the public record, but it can overwhelm regulators with limited staff and create administrative complexity if any one piece of the bundle is contested. Sequential filings preserve familiar administrative routines and let operators stagger their investment decisions, but they can also extend service deployment by years and create incentives to skip filings, notably for earth stations located abroad. The hybrid approach is the most common in practice and balances administrative tractability with speed. Clear timeframes and deadlines for granting licences are also good practices.[10]

Issue 3. Public consultation, transparency, and the publication of filings

Regulators must decide which filings get published, when public comment is invited, what documents (e.g. technical, commercial, and ownership) are entered into the file, and what remains confidential.

Approaches

Approach A: Full public records with notice and comment. Applications are published in their entirety (subject to redactions of trade secrets and personal data), there is a defined window of time for comment, and regulators publicly post their decision with their full reasoning. This is the model followed by the Federal Communications Commission (FCC) in the United States.[11]

Approach B: Public hearings, but only for certain classes of licences.

Approach C: Administrative reviews with limited disclosure. Countries can treat the filing and review as a confidential bilateral process between regulators and applicants, publishing only the granted licence. This pattern is common in jurisdictions where space activity is treated as a matter of national security.

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7 CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).
8 WATRA, *WATRA NGSO Framework* (June 2024).
9 WATRA, *WATRA NGSO Framework* (June 2024).
10 CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).
11 CFR, Title 47, Chapter I, Subchapter B, Part 25, "Satellite Communications".

Trade-offs

Approach A maximizes transparency, enabling existing operators to flag genuine concerns about interference and highlighting reciprocal deference from the host country's process with other regulators. However, the timeline is longer, and existing operators may lobby to delay procedures. Approach B is a workable middle path, but it invites disputes over to which class a filing belongs. Approach C is the fastest way, shifting any review of interference and ownership issues to the post-grant stage and providing less of a basis for recognizing reciprocal deference agreements from other regulators.

Issue 4. Licence tenure, renewal, and revocation

Operators rely on licence terms to determine investment certainty. ITU coordination protections and operator capital cycles are measured in periods of seven to 15 years, as shorter licence terms may discourage investment. At the same time, regulators need credible enforcement levers, notably the ability to revoke licences or impose conditions if operators fail to meet their security, interference, or service obligations.

Approaches

Approach A: Long-term licences (e.g. 15 to 30 years) with the presumption of renewal subject to continued compliance. The Undersecretariat of Telecommunications in Chile (SUBTEL) grants 30-year renewable terms; Australian authorities have the right to issue space apparatus licences for up to 20 years, with longer terms considered case by case; and the Office of Communications (Ofcom) in the United Kingdom issues spectrum licences for an indefinite period, remaining in force unless surrendered or revoked.[12]

Approach B: Medium-term licences (e.g. five to 10 years) with renewal contingent on a substantive review. In Ghana, the terms are up to 10 years for its landing-rights licence, five years for its SESN licence, and 10 years for its gateway licence. In July 2023, Malaysia issued a 10-year licence to Internet provider Starlink.[13]

Approach C: A short pilot or provisional-term licence (e.g. one to three years) to allow regulators and operators to observe the service in practice. The pilot regime in the Socialist Republic of Viet Nam (Decision 659/QD-TTg) authorizes operations for a limited period.[14]

Trade-offs

Longer terms maximize investment incentives and signal regulatory commitment, but they lock in conditions before market practice is well understood and complicate mid-term enforcement. Medium-length terms balance certainty with periodic check-ins, and they are now the predominant practice in newer NGSO frameworks. Short pilot or provisional terms let

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12 SUBTEL, "Telecommunication Services – Intermediate Services"; ACMA, "Satellites and space systems"; and Ofcom, "Statement: Satellite Earth Station Network licences" (September 2023).

13 National Communications Authority, *Satellite Licensing Framework in Ghana* (2024); MCMC, "Individual Licence – NFP, NSP & CASP"; WATRA, *WATRA NGSO Framework* (June 2024); and Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026).

14 Vietnam.vn, "Controlled pilot of telecommunications services using SpaceX's low Earth orbit satellite technology" (March 2025); Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026).

regulators test the framework against actual operations and make adjustments, but operators might discount the long-term value of the market, leading to less aggressive investment in customer terminals, marketing, and local presence. Triggers for revoking licences and intermediate enforcement steps short of revocation can be defined in advance under any of these approaches.

Issue 5. Trial, experimental, and sandbox authorizations

NGSO operators (and partnerships between mobile network operators [MNO] and satellites) frequently want to test their service before committing to a commercial launch, particularly for novel offerings like D2D, IoT, or satellite-backhauled fifth-generation (5G) mobile networks. Without a dedicated trial or sandbox option, every test requires a full commercial licence, which deters experimentation and slows market development.

Approaches

Approach A: A dedicated trial or sandbox framework. This can comprise a formal trial regime with defined technical guidelines, time-limited authorization (typically six to 12 months) and more lenient compliance obligations. The Trial, Experiment and Demonstration (TED) guidelines laid out by the Malaysian Communications and Multimedia Commission (MCMC) allow operators to conduct trials of up to 12 months without requiring a full licence. Canada's ISED developmental licence, which is generally granted for up to one year, is renewable and provides streamlined temporary access to spectrum during the testing period. The National Telecommunication Agency (ANATEL) in Brazil runs a sandbox that suspends certain regulatory requirements and restrictions temporarily to deploy D2D services, and the spectrum sandbox programme launched in January 2024 by the Department for Science, Innovation and Technology (DSIT) in the United Kingdom builds on the spectrum roadmap published by Ofcom in 2022.[15]

Approach B: A short-term experimental licence issued case by case. No standing framework is required, with each trial request granted as a short-term licence through normal procedures. This is common practice when regulators lack explicit agency to authorize trials under existing legislation.

Approach C: No trial pathway of any kind. Operators must obtain full commercial licences before any test, effectively ruling out experimentation by smaller operators and partnerships.

Trade-offs

Approach A welcomes innovation, accelerating regulatory learning and allowing regulators to observe novel offerings in practice—particularly D2D, IoT, and direct-to-mobile—before adopting permanent rules. Approach B works in jurisdictions without a standing framework, but it introduces transaction costs for each trial. Approach C is the most restrictive, all but excluding operator-led testing, which is particularly disadvantageous for emerging service models where regulatory uncertainty is itself the barrier. A trial framework can specify geographic

[15] MCMC, "Guidelines for Trial, Experiment & Demonstration (MCMC/G/01/19)" (January 2022); ISED, *Developmental Licence Playbook*; Mobile Time, *Anatel permite prestação experimental do D2D via sandbox regulatório*; Gov.uk, "DSIT regulatory spectrum sandboxes" (July 2025); Ofcom, *Spectrum Roadmap: Delivering Ofcom's Spectrum Management Strategy* (November 2022); and Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026).

limits, maximum duration, technical-monitoring obligations, and a clear pathway to receiving a commercial licence.

3.2 Market access architecture

Issue 6. Foreign ownership, local presence, and local investment requirements

NGSO operators are typically headquartered outside the host country and may have complex international ownership structures. Regulators must balance legitimate security, accountability, and economic-development interests against the operational challenges confronting satellite constellations that are unable to tailor their ownership structure or infrastructure to each market.

Approaches

Approach A: A local representative only, with no equity or infrastructure mandate. This entails a designated local agent to process services and act as a regulatory liaison, and it imposes no requirements for minimum local ownership, no mandatory local incorporation, and no mandatory local gateway.

Approach B: Local incorporation (e.g. a subsidiary) and a local representative, but with no equity floor. The Satellite Landing Rights licence in Ghana accepts corporate registration in a foreign jurisdiction, while the SESN licence requires incorporation in Ghana.[16]

Approach C: A minimum amount of local equity, in-country gateway facilities, or a partnership with a domestically licensed retail operator.

Trade-offs

Approach A minimizes friction and is most likely to attract competitive entry by multiple operators. Approach B is the most common middle path, as it maintains a clear legal basis for enforcement without dictating a specific economic structure. Approach C asserts the most sovereignty and may serve legitimate security and data-residency goals (issues 23 and 24), but it directly raises operating costs and can lead to operators bypassing smaller markets entirely. An alternative is to condition market access on certifications (e.g. cybersecurity, trusted supply chain, customer-data privacy, and cooperation on lawful interception [LI]) regardless of gateway location.

Issue 7. Service model and licensee definitions (capacity, service, and end user)

NGSO ecosystems feature multiple distinct roles, including the satellite operator, which provides capacity; the satellite-service provider, which sells access to this capacity; the telecommunication operator, which provides the retail offering to subscribers; and, increasingly, the MNO partner, which delivers D2D using its terrestrial spectrum. Regulators must decide which roles require licensing, the activities each licence authorizes, and how the categories map onto existing definitions in telecommunication law.

[16] National Communications Authority, *Satellite Licensing Framework in Ghana* (2024); WATRA, *WATRA NGSO Framework* (June 2024).

Approaches

Approach A: Role-differentiated licensing with a light touch upstream. This entails distinguishing capacity provision from service delivery, and imposing lighter or no licensing requirements on capacity providers leasing to licensed telecommunication operators, as well as concentrating consumer-protection and quality-of-service (QoS) obligations at the retail layer. This configuration is a common approach, as seen in Colombia (Resolution 376 of 2022, which eliminated the category "Registered Provider of Satellite Capacity") and Mexico.[17]

Approach B: A single integrated licence per operator, such as a comprehensive authorization that covers the space segment, the ground segment, and retail service. This treats operators as vertically integrated telecommunication carriers.

Approach C: Mandate wholesale-only or partnership-mandated retail, restricting satellite operators to wholesale and capacity sales and requiring them to partner with locally licensed retail operators.

Trade-offs

Approach A reduces regulatory overhead, attracts more capacity providers, and lets regulators focus their enforcement activities at the consumer-facing layer, assuming that a competitive retail market exists, which is not always the case in small-island or remote-market contexts. Approach B maximizes regulatory oversight over the entire value chain and simplifies enforcement, but it creates duplicate obligations and may deter integrated global operators. International practice cautions against Approach C, as restrictions on permissible lines of business curb innovation, narrow the choices available to consumers, and can be inconsistent with the specialized commercial models NGSO operators pursue (notably IoT, D2D, and direct sales to government and enterprise customers).

Issue 8. Market access and landing rights (Open Skies versus per-system)

The foundational policy choice is whether to require an explicit, system-specific grant of market access for each NGSO constellation (the traditional model for landing rights entails per-system authorization) or to authorize foreign-licensed systems automatically when they are listed in the Master International Frequency Register (MIFR) or appear on a regional or international approved list, i.e. the Open Skies approach. The choice determines how many applications regulators receive, what each one requires, and how much sovereignty countries retain over which constellations serve their territories.

Approaches

Approach A: Per-system landing rights with deferred technical reviews. Under this system, each NGSO system files for market access and leaves the engineering and operating specifics to the home administration (subject to the process being open and transparent). The host regulator focuses on the security, LI, ownership, and commercial terms.

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[17] MinTIC, Resolution 376 of 2022 (February 2022); Government of Mexico, *Law on Telecommunications and Broadcasting* (2025); IFT, Regulatory Provisions on Satellite Communications; and CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

Approach B: Automatic recognition, or the Open Skies approach. Foreign systems authorized by recognized regulators (e.g. members of the World Trade Organization [WTO] or a regional body) and registered with ITU operate automatically, with no separate filing for market access. SUBTEL has eliminated traditional landing rights in favour of a technologically neutral general authorization, and Canada's ISED Client Procedures Circular (CPC) 2-6-04 authorizes foreign satellites via email upon presentation of an ITU filing and WTO-member authorization.[18]

Approach C: A per-system review with a full domestic technical assessment. Each NGSO filing triggers a standalone domestic engineering and operating assessment, duplicating ITU and home-regulator analyses. While this has been the default approach for GSO historically, this method is now under pressure as application volumes increase.

Trade-offs

Approach A preserves national sovereignty, ensures security and law-enforcement screenings, and avoids redundant technical work, all while enabling a quick review. The Open Skies approach under Approach B offers the quickest route to market entry and minimizes the administrative burden. Approach C provides maximum control and is consistent with traditional GSO practice, but duplicative reviews can delay deployment and tie up technical staff, which is generally not justified if the NGSO system has already been through a rigorous ITU and home-regulator process.[19]

3.3 Spectrum management

Issue 9. International frequency coordination, the MIFR, and first-in-line rights

Every NGSO system goes through an ITU coordination process to be registered in the MIFR. Once in the MIFR, NGSO systems have "first-in-line" protection against subsequent systems. Host regulators must decide how to integrate the international register with national frequency assignments, how to treat first-in-line rights of foreign-licensed systems, and what bilateral coordination is required for border regions.

Approaches

Approach A: Streamlined acceptance of systems registered in the MIFR with minimal domestic filings.

Approach B: A full domestic frequency-coordination overlay, such as a separate national coordination review for each system, regardless of MIFR status. However, this approach rarely yields new findings for ITU-coordinated NGSO systems.

Approach C: MIFR-based recognition for border regions, with possible departures based on domestic frequency coordination in other regions. This can be accomplished by recognizing MIFR registration with respect to adjacent countries for systems whose footprint spills across

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18 SUBTEL, "Telecommunication Services – Intermediate Services"; ISED, CPC-2-6-04 – Procedure for the Submission of Applications to Approve the Use of Foreign-Licensed Satellites in Canada (April 2026).

19 Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026); CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

borders, while keeping the possibility to depart from these entries at the national level in regions where domestic decisions do not impact international frequency sharing.

Trade-offs

Approach A is the most efficient and respects the substantial investment that ITU and the originating administrations have made. Approach B duplicates efforts and can delay deployment by years. Approach C, which requires significant administrative resources, is possible only in countries large enough to have a clear distinction between geographical regions.

Regulators should bear in mind that first-in-line ITU rights are aligned with the home regulator coordination filing: once a system is in the MIFR, subsequent applications must coordinate around it. Authorization by ITU to enter the coordination phase generally expires after about seven years if the system is not brought into use. Under most approaches, the national table of allocations and licensee register is published online. For administrations that are behind in ITU coordination procedures and therefore risk seeing their access to orbital positions and strategic frequencies gradually reduced, one solution is participation in ITU study groups and shared regional positions at global radiocommunication conferences.

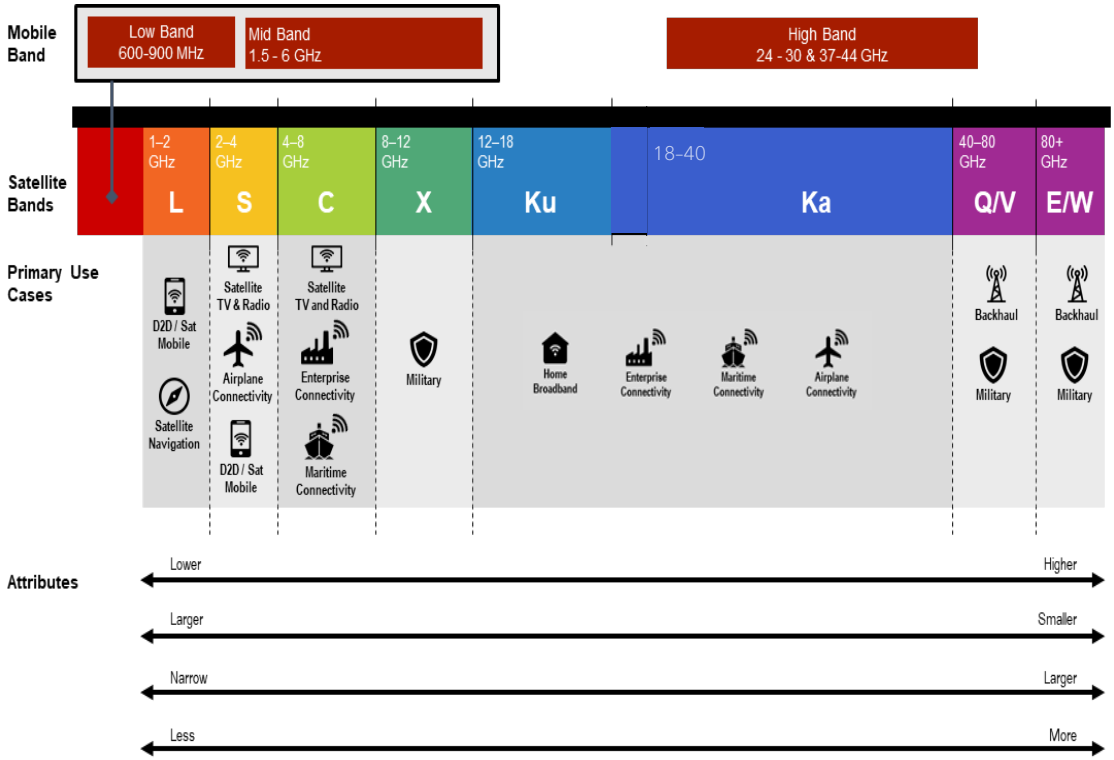
Some countries run their own domestic priority system in parallel with the MIFR. For example, the United States assigns NGSO fixed-satellite spectrum through a series of processing rounds. A system licensed in a later round must coordinate in good faith with previously licensed systems; absent an agreement, systems need to demonstrate compatibility using a defined degraded-throughput methodology rather than being barred outright.[20]

Issue 10. Spectrum allocation (Ka, Ku, V, and E bands; FSS versus MSS)

For fixed-satellite service (FSS) broadband, NGSO systems rely mainly on Ka and Ku spectrum, while V and E spectrum is beginning to serve backhaul and inter-satellite links (ISLs). Mobile-satellite bands (L, S, and segments of C and Ka) support satellite telephony and IoT. A country's allocation table must make explicit room for whichever bands operators intend to use, since a mismatch is the most frequent source of avoidable hold-ups. Mobile-satellite operations draw on L-band spectrum near 1 to 2 GHz, S-band near 2 to 4 GHz, and parts of C- and Ka-band spectrum.

[20] FCC, "Spectrum Sharing Rules for NGSO Fixed-Satellite Systems" (December 2024).

Figure 4: Satellite frequency bands and their primary use cases



Source: Adapted from NERA (2024), "How to price satellite spectrum."

Approaches

Approach A: A full national alignment with allocations for FSS and mobile-satellite service (MSS) under ITU Article 5. By publishing a national table that mirrors ITU allocations for satellite services across Ka, Ku, V, and E (FSS) and L, S, and Ka (MSS), operators can plan with certainty.

Approach B: A selective adoption, with bands held for future allocation. This entails authorizing only specific portions of Ka and Ku, and keeping the remainder for future review (e.g. to allow for the expansion of international mobile telecommunications [IMT]).

Approach C: Case-by-case authorizations tied to each licence. Instead of a standing allocation, each operator spectrum use is determined when granted a licence. This is common in jurisdictions that have not updated their table of allocations.

Trade-offs

Approach A maximizes investment certainty, lets operators plan multi-year capital deployments, and reduces the need for case-by-case coordination work. It also signals a country's intent to support satellite broadband. Approach B is administratively cautious and preserves flexibility, but every reserved band requires a separate proceeding when requested by an operator. Approach C is the least operator-friendly and creates substantial transaction costs.[21]

[21] CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

In mobile-satellite bands, scarce MSS spectrum is increasingly assigned by comparative selection rather than a first-come-first-served approach. In May 2026 the European Commission proposed a selection procedure encompassing the entire European Union (EU) for the harmonized 2 GHz MSS band to replace the use rights that are set to expire in 2027. The procedure would grant a single EU-wide authorization against milestone-based criteria (e.g. compliance with ITU Radio Regulations, satellite manufacturing and launch agreements, gateway earth stations, and the continuous provision of service) while allowing EU operators to reserve MSS capacity for governmental use.[22]

Issue 11. Spectrum fee structure

Spectrum fees directly affect prices for end users and incentives for operators to deploy their systems. Regulators must choose among cost-recovery (i.e. recouping administrative costs), economic-value (i.e. capturing economic rent), per-terminal or bandwidth (i.e. volume-based), and revenue-share approaches.

Approaches

Approach A: Cost-recovery or administrative fees, such as fees to recover the administrative cost of processing and oversight. The FCC pegs spectrum fees to the agency costs of processing and supervising applications. CITEL identifies administrative cost recovery as a leading principle, noting, "To promote affordable access… regulators should consider setting regulatory fees only to recover administrative costs associated with the applicable license."[23]

Approach B: Revenue sharing or a percentage of gross revenue. Thailand applies a 0.25 to 1.5 per cent annual fee, plus a 2.5 per cent contribution to a universal service fund (USF). Revenue sharing is easier to administer at scale, but it converts spectrum into a tax base.[24]

Approach C: Per-terminal or bandwidth-based fees, such as charging by unit of deployment or unit of spectrum occupied. This is the common legacy approach, as VSAT-era regimes typically charged per dish or per MHz. The two options under this approach behave differently, as per-terminal fees scale with the number of terminals operators deploy and bandwidth-based fees scale with the spectrum occupied, regardless of how many users it serves. Because a per-MHz rate can be set at the cost-recovery or rent-capturing levels, this approach spans the range between Approaches A and D, depending on where the rate is set.

Approach D: A high-value economic-rent or auction model. Charging market-determined prices that reflect economic value is common practice for terrestrial mobile spectrum, but several source frameworks advise against applying it to NGSO spectrum, which has different characteristics and supply economics.

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22 European Commission, "Commission proposes new authorisation for mobile satellite services for EU's resilience and competitive" (May 2026).

23 US Code, Title 47, § 158 ("Application fees") and § 159 ("Regulatory fees"); CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

24 NBTC, "Annual Licence Fee"; Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026).

Trade-offs

Approach A results in low barriers to entry and low end-user prices. Several frameworks propose that fees track real costs and usage, take account of the economic gains from extending connectivity to rural and remote areas, and avoid overlapping with customs duties or excise charges. Approach B is simple and produces predictable revenue, but it penalizes high-revenue operators, who tend to be the most willing to invest in coverage.

The two bases under Approach C differ in degree. Per-terminal fees scale directly with the success of the deployment, penalizing operators that extend their coverage furthest, which is why they see this approach as a legacy of the VSAT era. Bandwidth-based fees at least track the resource consumed and reward spectral efficiency, making them the more defensible variant where a usage-based fee is retained. Approach D is generally inappropriate for NGSO because the marginal cost of additional coverage in a country is low, and fees that capture rent reduce service quality and coverage.

The variety of approaches adopted by different countries illustrates the spread. Canada applies a per-MHz spectrum fee for the use of radio frequencies by generic earth stations for mobile earth stations of CAD 1 500/MHz per year for frequencies at or below 3.0 GHz and CAD 5/MHz per year for frequencies above 3.0 GHz. These rates are then multiplied by the total assigned spectrum to determine the annual fee. Colombia's Resolution 376 of 2022 significantly reduced spectrum satellite service fees that had represented a substantial operational burden and a barrier to expanding universal connectivity. Spectrum fees are typically assigned to service providers rather than to wholesale satellite-capacity operators, because satellite operators do not themselves use the spectrum.[25]

3.4 Equipment licensing

Issue 12. Type approval and equipment certification

Every NGSO terminal, ESIM, and gateway must meet equipment standards. Regulators can require domestic type approvals, recognize international standards directly (e.g. 3rd Generation Partnership Project [3GPP], the European Telecommunication Standards Institute [ETSI], and FCC equipment authorizations, as well as some ITU Radiocommunication Sector [ITU-R] Recommendations) or sign mutual recognition agreements (MRAs) with key trading partners.

Approaches

Approach A: Recognize international or foreign type approvals, such as type approvals from 3GPP, the FCC, ETSI, ITU-R Recommendations, or other internationally recognized bodies without separate domestic certifications. This is a common approach, as it expedites equipment deployment and lowers consumer costs. CITEL similarly endorses the self-certification of equipment where recognized standards exist (e.g. ETSI) plus the mutual recognition of type approvals.[26]

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25 ISED, "Notice No. SMSE-002-23 – Fee order for earth stations" (January 2023); MinTIC, Resolution 376 of 2022 (February 2022); and CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

26 Equipment standards and authorizations (3GPP, ITU-R, ETSI, and FCC); CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

Approach B: Domestic certification with procedures for internationally certified equipment (e.g. requiring domestic type approval but via an expedited pathway). The MCMC certification label under its Communications and Multimedia (Technical Standards) Regulations 2000 and Ghana's inclusion of the authorization of electronic communications equipment (type approval) within its satellite licensing framework illustrate this configuration.[27]

Approach C: A full independent domestic type approval, requiring full testing and certification for each equipment model.

Trade-offs

Approach A is the least expensive and fastest path, and it aligns with the practical reality of how equipment distributed globally is manufactured. However, it does require regulators to trust foreign certification. Approach B is the common middle path, allowing regulators to retain some control (e.g. a label, registration, or an electrical-safety overlay) without the delays that can result from full domestic re-testing. Approach C imposes a greater administrative burden, as it requires domestic expertise and mobilizes significant resources.

Issue 13. Customs, import duties, and equipment taxes

Even with blanket licensing and recognized type approvals, NGSO end-user equipment must clear customs, pay import duties, and be subject to whatever excise or value-added tax applies. Tax and customs treatment can be the difference between an affordable USD 500 terminal and an unaffordable USD 1,000 terminal, directly determining household adoption rates in rural and low-income markets.

Approaches

Approach A: Treat NGSO systems as standard consumer electronics. This means applying the same import duties, value-added tax, and excise treatment to them as to mobile phones, routers, and similar consumer devices.

Approach B: Reduced duties for satellite terminals. Administrations can apply preferential customs treatment to satellite terminals, including NGSO, to support rural-connectivity goals, including duty-free imports for licensed operators serving areas designated for universal service.

Approach C: Apply standard duties on telecommunication equipment, including specialty satellite tariff codes. Duties specific to telecommunication equipment are often higher than those for consumer electronics and may include specialty tariff codes for satellite dishes. This approach is common for administrations whose customs schedules were last updated in the GSO and VSAT era.

Trade-offs

Approach A is the strongest cost-reduction lever regulators have, as it directly reduces consumer prices and accelerates adoption. This can include the engagement of border and revenue

[27] MCMC, *Communications and Multimedia (Technical Standards) Regulations 2000*; National Communications Authority, *Satellite Licensing Framework in Ghana* (2024); Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026); and WATRA, *WATRA NGSO Framework* (June 2024).

agencies so that imports are expedited and any charges stay modest and fair. Approach B uses customs treatment as a coverage policy tool, but it creates complexity and may invite disputes over which terminals qualify. Approach C is the most revenue-positive in the short term, but it can lead to unaffordable prices for terminals in many emerging markets.

Customs and import restrictions on satellite equipment can include licensing requirements, tariffs, and compliance with technical standards, all of which can slow deployment if not addressed at the time the licensing framework is adopted.

Issue 14. Exclusion zones and licences for earth-station gateways

Earth-station gateways operate at high power and high capacity, connecting satellite constellations to terrestrial backhaul and the Internet. They typically require exclusive spectrum protection within a defined geographic area known as an exclusion zone, coordination with incumbent point-to-point microwave links that may share spectrum (such as in portions of the Ka band), and proximity to long-haul fibre.

Approaches

Approach A: Unified site-level licensing with a defined exclusion zone, including licensing gateways as a single facility instead of per antenna, publishing an exclusion zone or coordination contour, and requiring operators to coordinate with existing fixed and microwave licensees in advance. This approach is broadly consistent with FCC and Ofcom practices. Radiocommunications Assignment and Licensing Instructions (RALI) MS44 in Australia defines protected zones for high-power satellite ground stations. NGSO gateways operate as antenna farms with multiple identical antennas, as additional antennas do not significantly reduce the spectrum of others. This is why some jurisdictions apply a single site licence, not per-antenna fees.[28]

Approach B: Per-antenna licensing, which requires each antenna at the gateway to be individually licensed. This inflates fees, slows expansion, and creates artificial scarcity.

Trade-offs

Approach A reflects how modern gateways operate as integrated facilities with dozens of antennas under common management, and it aligns spectrum coordination with the technical reality. Approach B, on the other hand, can create costs that are not directly proportionate to the actual spectrum use or interference risk. Requiring an in-country gateway at all is a market-access condition, not a gateway-licensing choice, as addressed in issues six, 23, and 24.[29]

Issue 15. Earth stations in motion

Earth stations in motion (ESIM) allow NGSO terminals on aircraft, ships, vehicles, and trains to operate as they transit a country's territory or territorial waters. ESIM are commercially significant

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[28] US Code, Title 47, § 25.203, "Choice of sites and frequencies"; Ofcom, *Non-geostationary satellite earth stations: Licensing guidance* (March 2026); ACMA, Radiocommunications Assignment and Licensing Instruction MS44, *Frequency coordination procedures for the earth station protection zones* (July 2022); and CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

[29] CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

for nations with substantial maritime or aviation traffic (e.g. Pacific Islands, archipelagos in Member States of the Association of Southeast Asian Nations [ASEAN], and coastal Latin American and Caribbean States), but they also create potential loopholes for operators to use ESIM frameworks to deliver service in lieu of receiving full market-access authorizations.

Approaches

Approach A: Subject ESIM to a blanket terminal licence, with operations authorized under such licences if the equipment satisfies the same technical parameters. Some administrations require additional registrations for each ESIM-fitted vessel or aircraft for tracking and enforcement purposes. For example, Canada and Mexico subject ESIM to the same blanket policies they apply to ordinary user terminals. Implementing rules can follow the guidelines set out in Report ITU-R S.2261 and WRC-23 Resolutions 121 and 123.[30]

Approach B: Create a distinct ESIM licensing regime, often with separate fees and validation procedures. The NCC in Nigeria lists ESIM network frequency licences as a distinct category.

Approach C: Recognize only those ESIM licensed by trusted home regulators. This entails recognizing foreign-flagged ESIM operating under flag-State authorization without separate domestic licences, but only if the flag State's licensing regime meets transparency, trusted-equipment, and cybersecurity standards that are in line with the host market-access conditions.

Trade-offs

Approach A is administratively efficient and supports legitimate maritime and aviation activity. Approach B preserves regulatory oversight, but it adds obstacles that legitimate operators (e.g. fishing fleets, cruise lines, and airlines) typically address only when commercially justified. ESIM regimes are cautioned to not become channels for unauthorized entry for systems that lack market access, so vigilant monitoring and enforcement (issue 26) are essential under any approach.

Issue 16. End-user terminal authorization (blanket versus site-specific)

Modern NGSO end-user terminals are similar to consumer electronics, as they can be installed by users and are often portable and identical across deployments. Older rules written for large fixed VSATs generally demand site-specific licensing and per-terminal fees. The choice between site-specific and blanket licensing directly determines whether mass-market broadband can scale.

Approaches

Approach A: Blanket licensing for technically identical terminals. For example, a country can issue a single nationwide authorization that covers all terminals meeting the published technical parameters (e.g. antenna size, power, and band), with no need to file applications for each terminal site. This approach, which requires satellite services to be allocated on an exclusive basis at the national level because no individual coordination is possible, is endorsed in CITEL Recommendation PCC.II/REC. 68 (XLIII-24). Under this recommendation, blanket licensing

[30] ISED, CPC-2-6-03 – Procedure for the Submission of Applications for Generic Earth Station Spectrum Licences (May 2025); IFT, Regulatory Provisions on Satellite Communications; and CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

should cover customer terminals that can be operated on a fixed, nomadic and transportable, or ESIM basis, and per-terminal licensing or spectrum fees are discouraged for customer terminals deployed in large volumes because they raise costs for individual consumers.[31]

Approach B: Site-specific licensing for the location of each terminal.

Approach C: Blanket licensing for fixed home and business terminals, and a case-by-case approach to applications for high-power or sensitive sites. The former acts as the default, while the latter applies to terminals running at higher power, or located inside exclusion zones or close to sensitive sites (e.g. near airports), defence facilities, and research stations.

Trade-offs

Blanket licensing eases an administrative bottleneck that scales linearly with subscribers, as well as reduces consumer costs and is technically appropriate for mass-produced devices that operate within ITU-coordinated parameters. Site-specific licensing generates continuous regulatory revenue and provides visibility at the terminal level, but it can be impractical if there are more than a few thousand subscribers and creates strong incentives for unauthorized "grey market" terminals. The hybrid process in Approach C preserves the benefits of blanket licensing while maintaining the authority of regulators over edge cases, and it is the most defensible approach for regulators concerned about specific high-power or interference-sensitive scenarios.

3.5 New service models and technologies

Issue 17. Direct-to-device and supplemental coverage from space

Direct-to-device (D2D) allows unmodified mobile handsets to connect directly to NGSO satellites, either via MSS spectrum or partnerships using existing IMT bands. Regulators must decide whether to authorize D2D, on what spectrum, and under what coordination terms.

Approaches

Approach A: Authorize D2D under the existing MSS regime (L, S, and parts of C and Ka) if not already covered by the existing licence. Apple, Globalstar, Iridium, and others use this, and it aligns with existing ITU and national frameworks. D2D in MSS bands leverages 3GPP NTN specifications, ensuring compatibility and interoperability.

Approach B: D2D via IMT spectrum modification, allowing MNOs to modify their terrestrial IMT licences to permit satellite-based supplemental coverage in partnership with NGSO operators. The FCC regime for supplemental coverage from space (SCS) is one such example, and Ofcom and the Australian Media and Communications Authority (ACMA) have published regulatory guidance for operators of IMT satellite direct-to-mobile services. The Starlink-T-Mobile, Starlink-Virgin Media O2, and AST SpaceMobile partnerships utilize this approach.[32]

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31 CITEL, "PCC.II/REC. 68 (XLIII-24): Guidance for Blanket Licensing Regimes for Ubiquitously Deployed Fixed Satellite Service (FSS) Earth Stations" (2024).

32 FCC, *Report and Order of Further Notice of Proposed Rulemaking* (March 2024); Ofcom, "Statement: Direct to Device licence exemption regulations update" (updated June 2026); ACMA, *Regulatory guide: Operation of an IMT satellite direct-to-mobile service* (September 2024); and Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026).

Approach C: Wait for the decision on NTN-band designation to be made at WRC-27, deferring authorization of D2D via IMT until the conference allocates a specific IMT or NTN spectrum.

Approach D: Prohibit or heavily restrict D2D to protect the domestic mobile market.

Trade-offs

Approach A is the simplest administratively and uses the existing regulatory machinery. Although it serves emergency and short message service (SMS) use cases well, it offers limited capacity. Approach B is the most disruptive, but it also produces the largest connectivity gains, as it requires regulators to allow operators to amend their existing mobile-spectrum authorizations. Approach C is cautious, but it defers benefits that can be delivered more quickly. While Approach D protects existing players, it is a difficult method to justify in markets with significant gaps in rural coverage, and it can undo substantial connectivity gains in genuinely unserved areas. Approaches A and B are not mutually exclusive and can be implemented simultaneously.

Issue 18. Satellite as backhaul and hybrid 5G models

NGSO capacity is increasingly used as backhaul for terrestrial mobile networks in remote areas, connecting cell sites that are otherwise unreachable. This raises questions about how to licence MNO-satellite partnerships, what QoS standards apply, and how to integrate backhaul into national broadband and universal-service frameworks.

Approaches

Approach A: Subject satellite backhaul to the conditions of existing MNO licences, permitting MNOs to use satellite backhaul as a backhaul technology under their existing carrier licences, with no separate authorization.

Approach B: Require explicit licence amendments or partnership notices, such as by requiring the MNO and satellite operator to notify the relevant regulator or obtain an explicit endorsement of the backhaul partnership, creating a public record and letting the regulator keep track of the structure of the market.

Approach C: Licence backhaul as a distinct service tier, creating a specific authorization for satellite-trunk services.

Trade-offs

Approach A is the fastest and minimizes the obstacles to emergency, disaster, and rural deployments. Approach B improves regulatory oversight for the purposes of monitoring the market, but it does not add any real review. Approach C makes sense in larger markets with multiple downstream operators, where wholesale-only structures need explicit framing.

Issue 19. Specialized services, IoT and MSS, maritime, and aviation

Not all NGSO traffic is consumer broadband. IoT, maritime tracking, aviation safety, and emergency-distress traffic use specialized constellations (e.g. Iridium, Globalstar, Swarm, and E-Space), often in MSS bands at very low power. These services do not fit traditional definitions of telecommunication services and may face inappropriate regulatory treatment.

Approaches

Approach A: A distinct light-touch authorization for non-telecommunication satellite services, including the recognition of IoT and specialized MSS services as a separate category with fewer obligations regarding consumer protection, universal service, and QoS.

Approach B: Categorize them as standard telecommunication services and apply the general rules to them. While this is functional, it may impose obligations (e.g. contributions to universal service funds and retail consumer protection) that do not fit the service models of operators.

Approach C: A carve-out for specific use cases. One way of doing this is by making emergency distress, maritime safety, aviation safety, and government IoT exempt from licensing (subject to compliance with ITU Radio Regulations) and treating commercial IoT as a separate category.

Trade-offs

Approach A is the most flexible and accommodates the diversity seen in NGSO business plans, consumer broadband, IoT, asset tracking, fleet management, and environmental monitoring. This approach cautions against trying to fit specialized NGSO operators in ill-suited telecommunication-service categories. Approach B is administratively simple, but it can render specialized services uneconomic. Approach C is the most surgical, but it requires the careful delineation of boundaries.

Issue 20. Multi-orbit, software-defined, and inter-satellite link architectures

Emerging NGSO architectures combine multi-orbit constellations (low Earth orbit [LEO], medium Earth orbit [MEO], and geostationary Earth orbit [GEO] under one operator), software-defined payloads that can be reconfigured in orbit, and inter-satellite links (ISL) that move traffic between satellites without an intermediate ground hop. These architectures complicate traditional regulatory assumptions about licence scope, spectrum coordination, and gateway requirements. Certain LEO systems relay traffic directly between spacecraft instead of using a conventional bent-pipe design, which significantly changes the number of gateways required.

Approaches

Approach A: An operator-defined system scope within a single licence that labels a combined multi-orbit system as one integrated network, with technical conditions covering all orbital tiers. This is in line with the direction in which operators are currently moving.

Approach B: Separate licences per orbit or architecture component. Licensing LEO, MEO, and GEO components independently gives regulators more control, but it increases administrative efforts and rarely yields different regulatory conclusions.

Approach C: An operator-defined scope with conditions on dynamic reconfiguration, including a single licence with explicit conditions on software-defined payload reconfiguration, ISL operations across borders, and dynamic frequency switching.

Trade-offs

Approach A is the most practical because modern operators do not design constellations in single-orbit silos, which integrated licensing reflects. Approach B is administratively familiar,

but it creates licensing fragmentation that does not improve regulatory outcomes. Approach C is the most sophisticated, but it requires regulators to develop new monitoring and reporting frameworks.

3.6 National security and sovereignty

Issue 21. National security review

National security reviews focus on the risks to critical infrastructure in terms of continuity of service, foreign control, enforcement, and the need for resilient communications.

Approaches

Approach A: A standing interagency security review, which can be done by referring every market-access request to a coordinated interagency body (e.g. a telecommunication regulator working in tandem with defence, intelligence, and foreign affairs bodies).

Approach B: Operator certification with audit rights. This requires operators to attest to their ownership and control arrangements, including any potential foreign influence, and grant audit rights to regulators. A formal review can only be triggered by the discovery or disclosure of incriminating information.

Approach C: No specific national-security overlay. NGSO operators are treated like any other telecommunication provider with foreign investors, with the host country relying on generic reviews of the investment (such as a screening for any foreign direct investment).

Trade-offs

Approach A is the most thorough and allows non-telecommunication security expertise to inform decisions, although it slows down the review process and requires interagency cooperation. Approach B offers the lightest touch, but it relies on the credibility of certifications and the audit capacity of regulators. Approach C is the simplest, but it is rarely defensible for systems that carry traffic relevant to national security.

A national security review is distinct from cybersecurity standards (issue 22), which are questions of technical compliance rather than ownership. One approach is for foreign-satellite authorizations to be conditional on annual security audits, the certification of terminal equipment, minimum encryption requirements, and the right to suspend service in the event of a proven threat to national security.

Issue 22. Cybersecurity standards

NGSO operators carry traffic across national borders and have facilities (e.g. gateways, satellite-control links, and user-terminal management infrastructure) that adversaries may target. Regulators must decide what cybersecurity standards apply to operators and how compliance is verified.

Approaches

Approach A: A risk-based certification against international standards. This requires operators to certify compliance with international standards (e.g. ISO/IEC 27001 for managing information security, the National Institute of Standards and Technology (NIST) Cybersecurity Framework, and IEC 62443 for industrial systems and satellite supplements) and to undergo periodic audits by third parties. CITEL endorses ISO 27001-based risk analysis, and sharing intelligence from the Space Information Sharing and Analysis Centre (ISAC) and EU ISAC with satellite operators.[33]

Approach B: Implementing a national cybersecurity framework with specific technical requirements (e.g. timelines for reporting incidents, encryption standards, access controls, and requirements for security operation centres). The Network and Information Systems (NIS) Regulations in the United Kingdom and the EU Second Network and Information Security Directive (NIS2) are examples of this approach.f Legislation.gov.uk, "The Network and Information Systems Regulations 2018"; Legislation.gov.uk, "Telecommunications (Security) Act 2021"; and European Union, "Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148 (NIS 2 Directive)".

Approach C: An outcome-based process with security plans tailored to operators, entailing the establishment of security outcomes (e.g. the ability to detect and respond to incidents within defined timeframes) and requiring operators to file approved security plans that describe how risks are managed.

Trade-offs

In Approach A, cybersecurity is treated as an objective with multiple technical-compliance pathways, and certifications that meet international standards ease the burden placed upon regulators during technical reviews. Approach B provides the most clarity for operators, although it requires regulators to maintain technical frameworks, which can be a substantial commitment for small regulators. Approach C is the most flexible but also the most operator-specific, requiring regulators to meaningfully engage with each filing.

Issue 23. Lawful intercept capability

Law-enforcement agencies require the technical capability to intercept communications pursuant to relevant legislation, and NGSO architectures with traffic flowing through foreign gateways make this complicated. Regulators must specify the intercept obligations of operators, the technical means by which they can meet these requirements, and the chain of custody for intercepted material.

Approaches

Approach A: An objective-based intercept obligation and technology-neutral compliance. This requires operators to maintain the capability to lawfully intercept communications that

[33] ISO/IEC 27001, "Information security, cybersecurity and privacy protection – Information security management systems – Requirements" (2022); NIST, "Cybersecurity Framework"; IEC 62443, "International benchmarks for industrial digital twins" (April 2024); and CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

fall within the laws of the relevant jurisdiction without prescribing how, allowing for virtual access, secure tunnels, or remote dashboards. Recommendations 4.2(b) and 4.2(i) of the West Africa Telecommunications Regulators Assembly (WATRA) endorse this approach and suggest leveraging gateway infrastructure in neighbouring countries through established protocols.[34]

Approach B: A standards-based intercept obligation requiring compliance with specific LI technical standards, such as those of ETSI, 3GPP, and the Communications Assistance for Law Enforcement Act (CALEA). This provides clarity for operators who already have global compliance frameworks in place. CITEL recommends the ETSI standards to ensure global compatibility and security.[35]

Approach C: A remote monitoring or common platform. Operators in coordination with regulators or law enforcement agencies can develop a platform capable of accessing subscriber information and, depending on local laws, communications content.

Trade-offs

Approach A is flexible, as it allows operators to meet LI obligations through remote dashboards or coordinated access points. Approach B provides greater clarity, but it also requires regulators to stay up to date on rapidly changing standards. Approach C is the most invasive and raises concerns about violations of civil liberties.

3.7 Data, subscribers, and network oversight

Issue 24. Data residency, information localization, and privacy

Distinct from LI capability is the question of where data must reside, what data must be accessible to the host country, and what privacy protections do NGSO subscribers have.

Approaches

Approach A: Operators implement their own privacy measures rather than relying on a localization mandate. A country cannot impose requirements that data be stored or processed within it, and operators comply with the host country's data-protection laws on protecting the personal data of residents where applicable.

Approach B: Targeted localization for specific data categories, such as storing specific types of data locally (e.g. government communications, sensitive personal data, and telecommunication metadata) while allowing transit traffic to use foreign gateways.

Approach C: All subscriber traffic must transit a domestic gateway and remain available within the country.

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34 WATRA, *WATRA NGSO Framework* (June 2024).

35 FCC, "Communications Assistance for Law Enforcement Act"; ETSI, *Lawful Interception (LI): Internal Network Interfaces, Part 1: X1* (August 2025); 3GPP, *Lawful interception architecture and functions*, Reference No 33.107 (1999); and CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

Trade-offs

Approach A is the least stringent option and reflects the technical reality of how NGSO networks operate. Approach B is a practical middle path used by many jurisdictions, as it preserves a country's interest in protecting particular categories of data without imposing unrealistic requirements on traffic flow. Approach C provides maximum sovereignty over data, but it imposes infrastructure costs that may lead operators to bypass smaller markets entirely.

Privacy obligations typically apply under any approach. In countries where data localization measures are adopted, sensitive data is stored and processed within national borders unless otherwise authorized, with regular audits to check compliance. Cross-border mutual legal assistance and bilateral coordination with the gateway home jurisdiction (section 3.10) can address domestic interests without requiring local infrastructure.

Issue 25. Subscriber identification, know your customer, and activation controls

Identifying subscribers when a terminal is activated supports law enforcement, anti-fraud, and security objectives. It also prevents the unauthorized use of NGSO terminals, such as those procured in one jurisdiction and operated in another. Regulators must decide what identification is required from subscribers, how their identity is verified, and what records must be retained.

Approaches

Approach A: An operator-managed know your customer (KYC) system, although regulators retain audit rights. This can be accomplished by requiring the NGSO operator to verify a subscriber's identity documents at activation (e.g. a passport, country-issued identification document, or business registration) and retaining records that can be audited by regulators. WATRA Recommendation 4.2(f) states, "Administrations could require proof of user identification prior to activation of NGSO services to help identify individual users."[36]

Approach B: A regulator-managed subscriber registry. Subscribers are required to register with regulators (or designated agents) prior to activation and operators only activate registered terminals. While this is more burdensome, it provides regulators with greater oversight.

Approach C: A risk-based KYC system tiered by service type. For example, regulators can apply full KYC procedures to retail subscribers, and more lenient processes (or none at all) to specific use cases (e.g. IoT, machine-to-machine, fleet, and enterprise). This aligns a rigorous identification process with the demands of law enforcement agencies.

Approach D: No specific requirement to identify subscribers. It is common for low-cost retail telecommunication operators to rely on their commercial practices and general fraud-prevention obligations, but it creates difficulties when it comes to cross-border enforcement.

Trade-offs

Approach A is the most common and aligns with mobile-operator KYC requirements in most jurisdictions, as well as places a minimal burden on regulators. While Approach B provides the strongest enforcement lever, it creates an additional administrative step that can deter adoption. Approach C is the most pragmatic for diverse NGSO use cases, although using

[36] WATRA, *WATRA NGSO Framework* (June 2024).

such a system in certain instances (e.g. applying machine-tracking-grade KYC to a smart-agriculture IoT subscription) would be a disproportionate use of resources. Approach D offers the lightest touch, but it creates the cross-border enforcement problem identified in WATRA Recommendations 4.2(f) and 4.2(h). Subscriber identification is directly connected to LI (issue 23) and cross-border enforcement.[37]

Issue 26. Reporting, spectrum monitoring, and network-information obligations

Regulators need accurate and up-to-date data on operator deployments, spectrum use, subscriber counts, and network performance to manage interference, plan future spectrum assignments, monitor competition, and verify licence compliance. However, NGSO operators are global and may not be accustomed to country-specific reporting.

Approaches

Approach A: Periodic structured reporting with an online portal for submissions. Operators file structured periodic reports (typically biannually) on subscriber counts, terminal deployments, spectrum use, gateway operations, and network performance. The NCC in Nigeria requires two reports per year to be submitted by 7 January and 7 July via a designated email and online template. Mexican transmitting-earth-station licence holders also file reports twice per year.[38]

Approach B: Annual reporting when a licence is set to be renewed. This means fewer reviews but deeper reporting tied to licence-renewal milestones, placing less of a burden on operators but providing less timely data.

Approach C: Reports to be submitted upon request. Instead of a reporting requirement, regulators request data as needed. This is the most flexible option, but it can lead to inconsistent data over time.

Approach D: A real-time or near-real-time data feed via application programming interfaces (APIs), requiring operators to provide ongoing data via an API or dashboard. While this is the most informative for spectrum management, it is also the most burdensome.

Trade-offs

Approach A is the most common approach, striking a balance between the information required by regulators and the burden on operators. Nigeria's biannual structured reporting (e.g. spectrum utilization, equipment, and site information) is a useful template.[39] Approach B can be utilized infrequently by administrations seeking to actively and regularly monitor spectrum usage and other characteristics. Approach C may face challenges in situations in which operators do not voluntarily provide comprehensive data. Approach D is the most informative, but it also requires regulators to maintain certain infrastructure that may exceed available capacity.

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37 WATRA, *WATRA NGSO Framework* (June 2024).

38 NCC, "Space Services"; IFT, Regulatory Provisions on Satellite Communications; and WATRA, *WATRA NGSO Framework* (June 2024).

39 NCC, "Reporting Templates"; WATRA, *WATRA NGSO Framework* (June 2024).

Issue 27. Interconnection, termination, and wholesale-access obligations

NGSO operators may need to interconnect with terrestrial networks for routing voice traffic, SMS origination and termination, exchanging IP traffic, or offering wholesale capacity to other Internet service providers. These processes engage two distinct regulatory levers that are not applied the same way. Interconnection and termination govern how traffic is exchanged between networks, including voice termination on the public-switched telephone network, subject to regulated termination rates where they apply. Wholesale access is a separate issue, focusing on whether operators must offer their capacity to competing retail providers, and on what terms if so. Regulators must decide what obligations apply under each, recognizing that the two address different competition concerns.

Approaches

Approach A: Use a standard interconnection framework applied to NGSO operators. This can entail applying existing interconnection rules (e.g. fair, reasonable, and non-discriminatory access to incumbent networks, and regulated termination rates where applicable) to NGSO operators that offer voice or carrier-grade services.

Approach B: Restricted termination routed through licensed international transit carriers. For example, countries can limit the ability of NGSO operators to terminate international voice traffic on domestic public-switched telephone networks, unless operators have arrangements with licensed international transit carriers (international wholesale voice carriers) or international-gateway licensees, a voice-carriage role distinct from the method of wholesale capacity access outlined under Approach C.

Approach C: Mandated wholesale access obligations. NGSO operators with significant market presence are required to offer wholesale capacity to competing retail providers on fair, reasonable, and non-discriminatory terms.

Approach D: No specific interconnection obligation beyond commercial negotiations, treating interconnection as a matter of such negotiations between operators.

Trade-offs

Approach A integrates NGSO operators into a country's existing competitive framework and supports a level playing field with terrestrial operators. Approach B is used at times to protect international-gateway licensees from being bypassed via satellite voice, and while this protection may serve legitimate revenue interests, it can also reduce competition. Approach C is the most pro-competition, but it requires a careful analysis of market power to identify which operators will be subject to this approach. While Approach D may suffice in genuinely competitive markets, it is unlikely to deliver wholesale access in markets with one or two dominant retail providers. Approaches A, B, and D address the interconnection and termination lever, while Approach C addresses the separate wholesale access lever and can be adopted in combination with any of the other approaches. Countries can also choose to not adopt wholesale access, in which case wholesale supply is left to commercial negotiations, as seen in Approach D.

3.8 Consumer protection, universal service, and disaster response

Issue 28. Service quality and quality-of-service disclosure

NGSO services have characteristics (e.g. variable latency, weather-related outages, ramp-up periods, and capacity sharing among many subscribers) that differ from terrestrial broadband. Regulators must decide whether to impose terrestrial-equivalent QoS standards, allow flexible disclosure-based regimes, or set NGSO-specific benchmarks.

Approaches

Approach A: A disclosure-based regime with satellite-specific or NGSO-specific metrics. This requires being transparent about expected latency, the probability of weather-related outages, congestion behaviour, and the terms of service-level agreements. Regulators can investigate if there is evidence of material misrepresentation.

Approach B: Performance benchmarks for satellite broadband. This entails setting satellite-specific or NGSO-specific minimum download and upload speeds and uptime thresholds. Malaysia's general QoS standards for broadband apply to satellite providers, while Thailand requires QoS commitments as part of applications for landing-rights licences.[40]

Approach C: Terrestrial-equivalent QoS standards, such as the application of existing terrestrial broadband QoS rules without modification. However, there is a risk of discouraging market entry if unrealistic standards are imposed on operators or satellite technology.

Trade-offs

Approach A respects the technical characteristics of NGSO operators while also protecting consumers from misrepresentation. Approach B provides clearer signals to consumers, but it requires a careful calibration of which targets are achievable. Approach C protects consumers the most, but it is the least workable in practice and may drive operators away.

Issue 29. Tariff and pricing oversight

NGSO end-user prices reflect terminal costs (often USD 300 to 600 when subsidized by the vendor), monthly service fees (USD 30 to 150), spectrum and regulatory fees, and import duties. Regulators must decide whether to oversee tariffs (e.g. require filing or approval), allow market pricing, or oversee tariffs only in specific service categories.

Approaches

Approach A: Allow market pricing without any tariff oversight, therefore treating NGSO as a competitive retail service. This is the broader direction of pro-competition policy, as competition among multiple NGSO providers brings prices in line over time.

Approach B: Tariff filings or notifications, but no approval necessary. This approach requires operators to file tariffs for transparency but does not require any kind of pre-approval, allowing regulators to observe pricing without restricting commercial flexibility.

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[40] MCMC, *Communications and Multimedia Act 1998*; Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026).

Approach C: Require approval for tariffs or set flat rates. For example, Sierra Leone's National Communications Authority (NatCA) approved a flat-rate fee structure for Starlink based on a system used in Rwanda. The proposed tariff chart included a user-terminal cost of SLL 11.5 million (approximately USD 511), a monthly cost of SLL 822 000 (approximately USD 37), and a first-year total of SLL 20.5 million (approximately USD 913).[41]

Approach D: Tariff oversight only for universal-service designated services, so for those delivered with universal-service support or in designated underserved areas (consistent with reverse-auction subsidies). Under this approach, commercial services are priced freely.

Trade-offs

Approach A offers the lightest touch and is most consistent with the vision of a market in which multiple operators are competing. This approach presumes that competition provides the required market discipline, which is increasingly true as multiple LEO operators enter markets. Approach B preserves competitive discipline while giving regulators data to detect concerning patterns. Approach C provides the most direct protections for consumers, but it raises the question of who sets the rates and on what basis. Flat rates also tend to ossify pricing as costs change. Approach D is the most targeted and most consistent, with the broader emphasis on competition reflected in many frameworks.

Issue 30. Emergency call routing (112/911)

Subscribers placing emergency calls expect to reach local dispatchers, but NGSO networks with foreign gateways and satellite-to-satellite routing may default to the emergency numbers in the home jurisdictions of operators. Regulators must decide whether NGSO-equipped devices—especially D2D-capable handsets—need to support local emergency-number routing, and how this can be verified.

Approaches

Approach A: Mandatory emergency-call routing in equipment standards. This means automatically routing 112/911-equivalent emergency calls from satellite-connected devices to local dispatchers, regardless of the subscriber's primary mobile provider. This is commonly treated as an equipment-standards requirement.

Approach B: Operator-provided emergency-call routing as a licensing condition. Make local emergency-call routing a condition of market access rather than an equipment requirement, allowing operators to design technical solutions within defined service-level outcomes.

Approach C: No specific NGSO emergency-routing requirement. Operators rely on the emergency-routing arrangements and existing frameworks for emergency services in their home jurisdiction, although these may not address satellite-routed calls.

Trade-offs

Approach A offers the most protection to consumers and is increasingly being treated as essential, particularly for D2D services that may be the only available connection during

[41] WATRA, *WATRA NGSO Framework* (June 2024).

emergencies. Approach B is more flexible, but it requires regulators to define the acceptable outcomes (e.g. a call connects to the local public safety answering point within a certain number of seconds). While Approach C offers the lightest touch, it creates safety gaps and is increasingly hard to defend. Emergency-call routing can be coordinated with other emergency-management frameworks (issue 32).

Issue 31. Universal service obligations

NGSO operators are uniquely capable of reaching unserved areas, but terminal costs and per-megabit prices remain barriers. Regulators must decide whether to require NGSO operators to contribute to a universal service fund (USF), whether NGSO services qualify as USF recipients, and whether they should set affordability targets for designated communities.

Approaches

Approach A: NGSO operators contribute to USFs and are eligible for disbursements from them to support deployment in unserved areas, meaning that operators are treated as full USF participants. This configuration is a common approach, with Thailand requiring a 2.5 per cent USF contribution. Nigeria, Kenya, South Africa, India, and the United States require operators to contribute a percentage of revenues to a national USF. According to the CITEL technical notebook, "all USF contributors should have access to such funds to achieve the public-policy objective of serving underserved and unconnected areas," and there should be "a technology-neutral approach to USF funding that allows for the consideration of all viable solutions, including satellite, terrestrial, and emerging technologies."[42]

Approach B: Rely on market forces rather than require any specific universal service obligations (USO). This allows NGSO operators to compete without USF contributions or specific coverage targets.

Trade-offs

Approach A integrates NGSO operators into existing universal-service frameworks and ensures fairness with terrestrial competitors. The most efficient allocation mechanism for disbursing funds is competitive reverse auctions, during which operators bid the minimum subsidy required to serve designated areas. Approach B may be appropriate in countries that are confident that market entry alone will reach unserved areas, but the experience of NGSO operators in the Pacific Islands, Latin America, the Caribbean, and ASEAN suggests that targeted universal-service mechanisms accelerate the timeline.[43]

Issue 32. Emergency and disaster-response authorizations

NGSO networks are uniquely positioned to provide rapid connectivity after natural disasters that disable terrestrial infrastructure. Standard licensing timelines, which can take months, are incompatible with disaster-response timelines, which cover hours to days, so regulators must

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42 Minehane, Scott, and Molloy, Simon, *Advancing ASEAN Connectivity: Harnessing Satellite Technology and Innovative Regulations to Bridge the Digital Divide* (2026); WATRA, *WATRA NGSO Framework* (June 2024); and CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

43 CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

establish standing emergency-authorization pathways before a disaster occurs.[44] Countries should also develop and implement national plans and strategies, such as national emergency telecommunication plans (NETPs), that enable the best use of information and communication technology (ICT), including satellite and LEO capacity, to increase resilience and deliver a fast, coordinated response when disasters strike.[45]

Approaches

Approach A: Establish a standing emergency-authorization framework. For example, establish a streamlined process for temporary disaster-relief satellite deployments (including NGSO), including pre-approved equipment, expedited customs clearance, and pre-positioned spectrum coordination. This configuration is a common approach, as several source frameworks point specifically to temporary ESIM permissions during emergencies or incidents of distress at sea. CITEL recommends that countries invoke and adhere to the Tampere Convention to expedite the provision of satellite and other telecommunication services in disaster situations, and that emergency exemptions from licensing and customs-clearance procedures be available to expedite the deployment of critical telecommunication equipment.[46]

Approach B: Make emergency authorizations on a case-by-case basis, issuing them upon request following each disaster and leveraging existing fast-track procedures.

Approach C: Have in place memoranda of understanding (MoUs) with satellite operators, including NGSO operators. Negotiate MoUs with key satellite operators that take effect automatically when an emergency is declared, with regulators retaining the authority to override the conditions of any agreement.

Approach D: Have no specific emergency framework, but instead rely on voluntary deployment by operators. This has been the case in several disaster responses, sometimes with retroactive licensing.

Trade-offs

Approach A is the strongest and most durable. It integrates satellite systems into national emergency-management frameworks through pre-established expedited authorizations in coordination with the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO) for ESIM activity and regular training exercises. Approach B is functional, but it wastes critical hours when speed matters most. While Approach C is operationally efficient, it creates an uneven playing field since it favours whichever operators are pre-positioned. Approach D is the most common practice and also the most disorderly. The pressures of responding to a disaster often cause operators to deploy without authorization, creating retroactive licensing problems.

3.9 Summary checklist: The 32-issue framework

This checklist distils the issues outlined in Chapter 3 into a single working tool. It states the key question regulators must answer and lists the approaches available. The checklist is intended to

44 CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).
45 ITU, "National Emergency Telecommunication Plans".
46 CITEL, *Update Draft Technical Notebook 'Satellite Regulatory Frameworks and Best Practices'* (August 2025).

be used as a self-assessment when reviewing an existing framework, as an outline when drafting a new framework, and as a quick reference during an active application. The approaches are starting points, not prescriptions; different circumstances require different choices, and the analysis provided in Chapter 3 can inform the design of the final framework chosen.

#	Issue	Key question for regulators	Approaches available
1	Legal authority and statutory framework	Does existing law cover NGSO operations, or is a new authority needed?	Rely on existing technology-neutral telecommunication law; temporary or provisional licences; or a dedicated NGSO framework.
2	Licence application architecture	Should the four to six required authorizations be bundled or sequential, or should a hybrid approach be utilized?	A fully bundled single filing; sequential filings; or a hybrid approach.
3	Public consultation and transparency	Which filings are published and which are open for comment?	A full public record with notice and comment; hearings for higher-impact classes only; or administrative reviews with limited disclosures.
4	Licence tenure and renewal	How long should authorizations run, and what triggers their renewal?	Fifteen to 30 years with the presumption of renewal; five to 10 years with conditional renewal; or one to three years for pilot projects.
5	Trial, experimental, and sandbox authorizations	Is there a standing pathway for short-term trials and experiments?	A dedicated trial or sandbox framework; case-by-case experimental licences; or no trial pathway.
6	Foreign ownership and local presence	What kind of local presence is required of foreign-headquartered NGSO operators?	A local representative only; local incorporation plus a representative; or local equity, along with gateway or retail-partner mandates.
7	Service model and licensee definitions	Are capacity, service, and retail roles licensed separately or together?	Role-differentiated with a light touch upstream; a single integrated licence; or wholesale-only or a mandated partnership.
8	Market access and landing rights	Should regulators utilize a per-system approach to authorization or implement automatic recognition (Open Skies)?	Per-system with a deferred technical review; Open Skies/automatic recognition; or per-system with a full domestic technical review.
9	Frequency coordination, MIFR, and first-in-line rights	Can MIFR registration substitute for domestic coordination?	Streamlined acceptance of MIFR entries; a full overlay of domestic coordination; or MIFR for border regions, plus domestic coordination for other regions.
10	Spectrum allocation (Ka, Ku, V and E, and FSS and MSS)	Does the national table accommodate all bands that NGSO operators plan to use?	Full alignment with ITU Article 5; selective adoption; or granting licences on a case-by-case basis.

(continued)

#	Issue	Key question for regulators	Approaches available
11	Spectrum fee structure	How are spectrum and licensing fees calculated?	Cost-recovery/administrative; by revenue share; per-terminal or bandwidth; or auction/economic-rent.
12	Type approval and equipment certification	Should regulators recognize international type approvals or require domestic certification?	Recognize international certification (e.g. FCC, 3GPP, ETSI, and ITU-R); domestic certifications but with an expedited process for holders of international ones; or full independent domestic type approval.
13	Customs, import duties, and equipment taxation	How are NGSO terminals taxed at import and sale?	Treated like standard consumer electronics; reduced or preferential duties; or telecommunication-specific duties.
14	Earth-station gateway licensing	How should earth-station gateways be licensed?	Unified site-level licence plus exclusion zone; or per-antenna licensing.
15	Earth stations in motion	How should ESIM be authorized?	Extended from blanket terminal licence, plus registration; a distinct ESIM regime; or recognition only for ESIM from trusted home regulators.
16	End-user terminal authorization	Should there be blanket licensing for terminals or should they be considered on a site-by-site basis?	A nationwide blanket licence; site-specific licensing per terminal; or a hybrid system.
17	Direct-to-device and supplemental coverage from space	On what spectrum and in coordination with what can D2D be authorized?	MSS spectrum (existing framework); IMT modification (SCS-style partnership); await designation by WRC-27 NTN; or restrict authorization pending a mobile-market review.
18	Satellite as backhaul and hybrid 5G	How are MNO and satellite backhaul partnerships licensed?	Under the existing MNO licence; as an explicit amendment or partnership notice; or as a distinct satellite-trunk service tier.
19	Specialized services (IoT and MSS, maritime, and aviation)	Should non-broadband NGSO services be regulated as telecommunication services?	A distinct light-touch authorization; treat them as standard telecommunications; or carve-outs for specific use cases.
20	Multi-orbit, software-defined radio, and inter-satellite links	How does licensing accommodate integrated and dynamic architectures?	A single licence covering an integrated system; separate licences per orbit or component; or a single licence with reconfiguration conditions.
21	National security review	What review applies to foreign ownership and control over domestic operators?	Standing interagency reviews; operator certification with audits; or no specific overlay.

(continued)

#	Issue	Key question for regulators	Approaches available
22	Cybersecurity standards	What cybersecurity standards apply, and how is compliance with them verified?	Risk-based certification against international standards; a domestic prescriptive framework; or an outcome-based approach with security plans.
23	Lawful intercept capability	How do operators provide intercept capability when gateways are foreign?	An objective-based and technology-neutral system; a standards-based one (e.g. ETSI, 3GPP, CALEA); or remote monitoring or a common platform.
24	Data residency, information localization, and privacy	What data must reside or be accessible in country?	No localization mandate; targeted localization for specific data categories; or full data residency/domestic gateway routing.
25	Subscriber identification, know your customer, and activation controls	Is the identity of a subscriber verified at terminal activation?	Operator-managed KYC with audits; a regulator-managed registration; risk-based KYC tiered; or no KYC requirement.
26	Reporting, spectrum monitoring, and network information	What reports must operators submit to regulators?	Periodic structured reporting via portal; annual reporting at license renewal; on-demand reporting; or a real-time API feed.
27	Interconnection, termination, and wholesale access	What interconnection and wholesale obligations apply?	A standard interconnection framework; restricted termination via wholesale-carrier; mandated wholesale-access; or commercial negotiations only.
28	Service quality and quality of service (QoS) disclosure	Given the variable performance of NGSO operators, what QoS standards apply?	Disclosure-based with NGSO-specific metrics; satellite-specific performance benchmarks; or terrestrial-equivalent QoS.
29	Tariff and pricing oversight	Do regulators approve, monitor, or not enforce NGSO retail tariffs?	No oversight (market pricing); tariff filings or notifications only; tariff approval or a flat rate; or oversight of USO services only.
30	Emergency-service call routing (112/911)	Are emergency calls routed to local dispatchers from satellite-connected devices?	Mandatory routing in equipment standards; operator-provided routing as a licensing condition; or no specific NGSO requirement.
31	Universal service obligations	Do NGSO operators contribute to USOs? Are NGSO services USO-eligible?	USF contribution and eligibility; or no USO obligations.

(continued)

#	Issue	Key question for regulators	Approaches available
32	Emergency and disas-ter-response authorizations	Is there a pre-established pathway for disaster-relief deployments?	Standing emergency-authorization framework; case-by-case authoriza-tion during a disaster; pre-positioned MoUs; or a reliance on operator goodwill.

Source: Authors.

3.10 Other issues for regulators to consider

The issues below complete the licensing picture, but they are either not specific to NGSO systems, are addressed principally through general telecommunication law, or sit largely outside the NGSO licensing process itself. Regulators should nonetheless confirm that each is addressed in their frameworks, if not specifically in the NGSO licensing instruments.

Reliance on the home administration space-station review. When a foreign-licensed constellation seeks market access, regulators must decide how much weight to give to the home administration technical and regulatory findings. Most administrations that are not home regulators for any NGSO system defer to the home administration on technical matters while conducting their own security and market screenings.

Power-flux density and equivalent power-flux density limits. Articles 21 and 22 of the ITU Radio Regulations set power flux-density (PFD) and equivalent power-flux density (EPFD) limits to protect terrestrial services and GSO networks from NGSO interference. Most regulators mirror ITU limits and track their ongoing review (including at WRC-27) rather than setting national limits. In 2026 the United States has moved to replace fixed EPFD limits with performance-based GSO-NGSO coordination.[47] However, few administrations have the monitoring capability to enforce different national limits, which makes international alignment the practical default.

Consumer protection and dispute resolution. Protections for satellite-broadband subscribers (e.g. handling of complaints, disclosure of coverage limitations, refund procedures, and dispute resolution) are largely an application of general telecommunication consumer rules rather than an NGSO-specific matter. Regulators can extend the existing consumer framework to NGSO providers, add a targeted overlay for distinctive risks such as terminal purchase commitments and coverage-versus-advertising gaps, or rely on co-regulatory ombudsman schemes.

Regional coordination and harmonization. Regional bodies such as CITEL, WATRA, the African Telecommunications Union (ATU), ASEAN, and the Communications Regulators' Association of Southern Africa (CRASA) are developing shared NGSO licensing templates, harmonized technical approaches, and mutual recognition and type-approval arrangements. Active participation lowers the analytical burden on any single regulator, strengthens negotiating positions with global operators, and reduces the risk of divergent national rules fragmenting a regional market.

[47] ITU, *Radio Regulations: Articles* (2024); FCC, "Modernizing Spectrum Sharing for Satellite Broadband", 47 CFR Part 25 (May 2026).

Cross-border terminal use and enforcement. Terminals activated in one country and used in another raise licensing, fee, and enforcement questions that no administration can resolve alone. The available tools include operator-side geofencing and deactivation obligations, subscriber-level KYC controls, mutual recognition of terminal authorizations at the regional level, and diplomatic channels with the home administrations of operators where necessary.

Orbital sustainability, debris mitigation, and atmospheric considerations. Debris mitigation, end-of-life disposal, and the atmospheric effects of large constellations are principally addressed by the launching State or home State through multilateral processes, but market-access conditions can reinforce them. Approaches range from a confirmed deferral to the home regulator to domestic standards informed by international guidelines, as reflected in the draft EU Space Act and the FCC orbital-debris and end-of-life rules.

Chapter 4. Conclusion

This toolkit traces the full arc of NGSO licensing, from the market and technology forces reshaping satellite communications and the international mechanisms that frame national action, to the 32 licensing issues which national frameworks must address. The changes required may be more structural than cyclical. LEO constellations have moved satellite broadband from a niche, geostationary satellite orbit-shaped service into a mainstream access technology capable of serving entire national markets. Licensing frameworks written for a handful of geostationary filings are now being tested by systems containing thousands of satellites and mass-market user terminals, as well as by the ambitions of operators to launch direct-to-device (D2D) services.

What is clear is that no regulator starts from zero. The ITU Radio Regulations, the filing and coordination chain, and the home administration space-station review together carry much of the technical burden. In contrast, the domestic task is narrower. Countries have to decide how international outcomes are translated into domestic regulations, as well as to grant and condition the small set of authorizations an NGSO operator must hold, including market access for the space segment, licences for gateways and other earth stations, the authorization of user terminals, spectrum assignments and, where applicable, a telecommunication service licence.

This toolkit organizes domestic decisions into 32 issues across eight categories, from legal and procedural foundations to consumer protection, universal service, and disaster response. The approaches to each issue are set out, as are the trade-offs among them. Three common threads run through nearly every issue. The first is speed to market versus a domestic review of the technology. Although every additional filing, hearing, or independent technical assessment increases transparency, they can delay service to communities that satellite systems are often best placed to reach first. The second thread is leverage versus control. Regulators can rely on ITU processes, home-administration findings, and international type approvals, reserving national efforts for country-specific concerns; or they can duplicate those processes domestically, which requires significant investments in staff and time. The third thread is revenue versus affordability. Spectrum and licence fees that treat NGSO systems as an extractive opportunity are ultimately paid by end users, and they can price the service out of the very markets they are meant to serve.

Pragmatic starting points emerge for the majority of regulators that are not home administrations for any NGSO system, including technology-neutral legislation rather than bespoke satellite statutes; a bundled or closely coordinated application architecture; conditional reliance on the home administration review combined with domestic security and market screenings; blanket authorization of user terminals; cost-oriented administrative fees, at least while the market develops; and standing pathways for trials, experiments, and emergency deployments. The country examples throughout Chapter 3 show deliberate and defensible departures from every one of them, and the right choices depend on each country's market structure, institutional capacity, and policy objectives.

Capacity is the binding constraint for many administrations, and any framework should be designed around this. Scarce technical staff are best focused on gating decisions (e.g. legal authority, market access, spectrum, and terminal authorization) with recognition, deference, and regional cooperation doing the work elsewhere. The summary checklist in section 3.9 supports that approach, as it states the key question for each issue and the approaches available to audit

an existing framework, outline a new one, or be used as quick references when reviewing an application.

The issues listed in section 3.10 are a reminder that a licensing framework is part of a wider legal and institutional system. Consumer protection, regional harmonization, cross-border enforcement, compliance with the power limits set in the ITU Radio Regulations, and orbital sustainability all are crucial to a national framework, but they are addressed principally through general telecommunication law, regional bodies, or international processes.

Finally, any framework should be built to adapt to innovations and changing conditions. WRC-27 will allocate new radio frequency bands for satellite services, as well as review regulatory and technical conditions for gaining access to spectrum, notably for D2D services. Multi-orbit and software-defined systems are blurring the lines between traditional licence categories, and regional bodies are converging on shared approaches to market access and terminal recognition. Review clauses, sandbox and trial mechanisms, and periodic public consultation all allow a national framework to absorb these developments without wholesale rewrites, and signal to operators and investors that the regime will remain predictable as the technology evolves.

The purpose throughout remains connectivity. Satellite systems are the fastest available way to serve unconnected and underserved communities, remote islands, and disaster-affected areas. A licensing framework that is clear, proportionate, and rooted in international practices can convert orbital capacity into national coverage. That, ultimately, is the standard against which every choice in this toolkit should be measured.

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