

Spectrum Pricing and Renewals

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Executive Summary

Spectrum access determines the performance and capacity of mobile networks and has a direct impact on wider digital development. Government approaches to spectrum pricing play an important role in shaping operators' ability to invest in network infrastructure, yet approaches vary widely between countries, creating significant differences in deployment outcomes.

Pricing methodologies that are centred on encouraging investment and innovation will help network development and benefit users. Spectrum licence renewals should also be rooted in the same principles to ensure continuation and sustainable growth of mobile networks.



Policy Positions

1. Spectrum should be priced at levels that benefit society

Spectrum priced at a level that encourages investment promotes higher coverage and quality of mobile services for consumers.

2. Spectrum prices should be derived from current market conditions

Historic assignment prices are best viewed as a supplementary reference, rather than a primary pricing mechanism. Valuation is influenced by market conditions, band characteristics, licence terms, competition and use cases, meaning there is no single approach.

3. Spectrum pricing should reflect increasing capacity and performance requirements

Future networks will increasingly rely on access to wider channel bandwidths and larger overall spectrum volumes. Larger spectrum assignments are needed to efficiently serve increasing consumer demand and applying historic per-MHz valuation risks inflating the overall cost of spectrum beyond its underlying economic value.

4. Auctions should be properly designed with low reserve prices

Reserve prices should be set conservatively to prevent distortion of auction outcomes. Prices that are too high or poorly benchmarked can undermine network coverage and quality and increase the risk of inefficient spectrum assignments.

5. Artificial scarcity impacts spectrum prices

Governments should avoid creating artificial scarcity through spectrum policy. Unjustified spectrum caps, delays in releasing spectrum, withholding spectrum from award processes, reserving excessive amounts for non-commercial uses, or imposing unnecessary restrictions on access can all reduce supply and lead to higher spectrum prices that are disconnected from underlying market value.

6. Longer spectrum validity and certainty of licence renewal encourage long-term network investment

Longer spectrum rights, supported by clear renewal expectations and adjusted prices that reflect current market and technology realities, give operators the certainty to plan capital-intensive deployments, recover investment over realistic technology cycles, invest efficiently, accelerate deployment, improve quality of service for consumers and support continued network evolution.

7. The cost of meeting obligations or investment commitments attached to licences should be reflected in their price

Obligations should be applied proportionately and only where necessary, while their costs should be reflected in spectrum pricing and clearly defined in advance. Overly stringent requirements risk undermining investment, distorting auction outcomes, and leading to restricted network deployment.



Background

By the early 2000s, auctions had become the default method for mobile spectrum assignment worldwide. Their adoption reflected government recognition of spectrum as a scarce economic asset and a broader shift in spectrum policy towards efficiency, opportunity cost, and market signals. However, while auctions remain a valid way of assigning in-demand spectrum, their design is critical and poorly designed processes can lead to spectrum cost becoming a barrier to mobile network development. At the same time, the modern requirements of connectivity need to be understood.

Over the past decade operators have increased their spectrum holdings by 80% while their revenues have decreased. The global spectrum cost to revenue ratio has increased by 63%, despite a reduction in the average unit price of a MHz of spectrum. These increased costs mean that operators are less able to

invest in mobile networks, leading to lower quality of service for consumers. Poor network quality lowers the productivity and impacts the economic and social improvements that mobile brings.

In response, governments have started to re-think how they provide access to spectrum for mobile network operators. A number of best practices are becoming evident globally, including pricing spectrum at a level that encourages investment, offering conditions instead of renewal fees, and making long-duration licences the default.

Determining which policies to apply will depend on local contexts and market needs. However, the following policy considerations can shape best practice to ensure network investment remains healthy and mobile can continue to benefit society.

Spectrum Price

The amount an operator pays to acquire the right to use spectrum. This is the upfront auction payment, administrative fee, or ongoing licence charge set or collected by the government.

Spectrum Cost

The economic burden of spectrum on the operator over time. It includes the licence price and how it interacts with revenues, financing costs, licence terms, renewal conditions, obligations, other fees, and restrictions on use.

Policy Positions

1. Spectrum should be priced at a level that benefits society

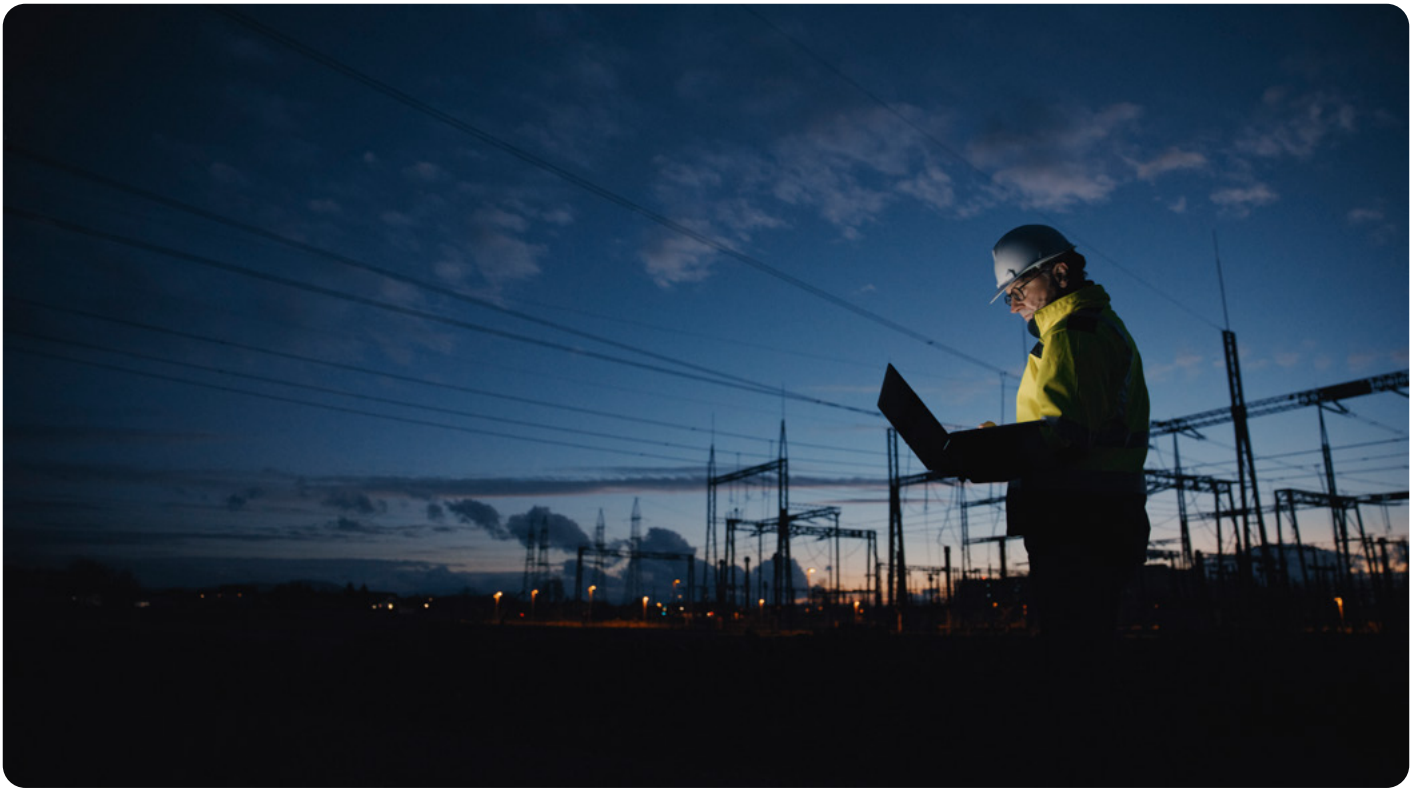
Well-executed spectrum valuation can support investment in mobile networks, improve coverage and speeds, and help maximise the wider socio-economic benefits enabled by mobile connectivity. However, some governments have historically priced spectrum in a way that maximises state revenue. While this could deliver short-term benefits for government treasuries, it leads to long-term consequences for the mobile industry and reduces the broader economic and social value generated by mobile.

Governments can instead price spectrum in a way that promotes long-term investment by mobile network operators (MNOs). If MNOs pay according to local market and revenue considerations, they have greater

resources to invest back into their networks, upgrading network infrastructure and delivering the latest networking technologies.

Assigning more spectrum at prices that encourage investment increases the coverage and quality of mobile services offered to consumers, which can help bridge the technology divide between and within countries. A 10 percentage-point spectrum price decrease compared to revenue translates to 6 percentage-point higher coverage and 7% higher speeds. These improvements reverberate throughout society, as demonstrated by mobile's \$7.6 trillion contribution to the global economy in 2025.





2. Spectrum prices should be derived from current market conditions

Policymakers are often drawn to anchoring prices to earlier award values because it provides a simple reference point as they seek to ensure that national prices are aligned with previous decisions. Using historical prices risks importing distortions from other markets and overlooking current domestic investment realities.

For these reasons, comparing to historical prices is best viewed as a supplementary tool, rather than a primary pricing mechanism, with spectrum prices instead based on policy objectives that prioritise efficient use and long-term network investment.

Spectrum valuation depends on a range of factors that vary across markets and over time. Ultimately, it should reflect the value derived from its use. These include demand and supply conditions, the characteristics of the frequency band, licence duration and obligations, competitive dynamics, and the intended use of the spectrum. As a result, there is no single optimal approach to valuation. Different methodologies can produce different outcomes, each capturing distinct aspects of value such as cost savings, revenue generation or opportunity cost.

In practice, a range of valuation approaches may be used, often in combination. Two common methods of valuation are set out below.

Benchmarking

Benchmarking involves comparing prices from other spectrum assignments, either domestically or internationally, to provide a reference point for valuation. It is relatively simple and transparent, as it draws on published data, but requires careful adjustment to account for differences in market conditions, licence terms and economic factors.

Modelling

Modelling techniques, such as avoided-cost or revenue-based models, estimate the value of spectrum by quantifying either the cost savings it enables (for example, through reduced network deployment costs) or the additional revenues it supports.

3. Spectrum pricing should reflect increasing capacity and performance requirements

As global demand for data continues to increase, MNOs need larger volumes of spectrum to respond to traffic and often rely on wider bandwidth.

Governments should progressively make adequate, harmonised and technology-neutral spectrum available to support future network capacity and maintain global competitiveness. Rising demand from data-intensive services, including IoT, AI, cloud gaming and edge computing, will require operators to access sufficient spectrum across bands to support 5G densification and prepare for future network generations. Spectrum planning should therefore include a clear harmonisation strategy that addresses interference management and enables co-ordinated use.

Future networks will also increasingly rely on access to wider channel bandwidths and larger overall spectrum volumes. This has implications for spectrum valuation. The economic value generated by a mobile network does not increase in proportion to the number of MHz assigned. As operators require larger spectrum

assignments to achieve the performance objectives of future technologies, applying historic per-MHz valuation benchmarks risks inflating the overall cost of spectrum beyond its underlying economic value. The relative prices of different bands vary given their scarcity, differences in characteristics, and how they can be used to enhance the coverage or throughput of networks.

Recent trends show that unit prices of spectrum (per MHz and population unit) have generally declined in recent years, particularly in the sub-1 GHz band, where prices declined by almost 75%. Meanwhile, higher frequencies saw more moderate declines. However, due to the higher MHz volume of spectrum needed, prices have still increased overall.

Spectrum pricing frameworks should therefore evolve to reflect the increasing quantities of spectrum required by future networks. This will promote efficient assignments and support network investments.



4. Artificial scarcity influences spectrum prices

More broadly, governments should avoid creating artificial scarcity through spectrum policy. Delays in releasing spectrum, withholding spectrum from award processes, reserving excessive amounts for non-public networks, or imposing unnecessary restrictions on access can all reduce supply and lead to higher spectrum prices that are disconnected from underlying market value.

Spectrum pricing and assignment policies should seek to maximise the long-term economic and social value of spectrum by ensuring timely access to sufficient spectrum resources, efficient assignment mechanisms and conditions that encourage investment in coverage, capacity and service quality.

Reserving spectrum exclusively for private networks can reduce the amount of spectrum available to public mobile operators, constraining network performance

and increasing spectrum scarcity. Consequently, spectrum scarcity can contribute to higher spectrum prices, which have been linked to reduced investment in network deployment, slower rollouts, more limited coverage and lower network performance. A spectrum set-aside of 100 MHz can reduce speeds by 24% and substantially impact the quality of service for consumers and enterprises using public networks.

During auctions, spectrum caps can play an important role in promoting competition and preventing concentration of spectrum holdings. However, regulators should recognise that spectrum caps and bidder eligibility restrictions also influence bidding dynamics. Restrictive caps can reduce the number of bidders competing for particular licences and limit the quantity of spectrum that bidders are able to acquire, thereby affecting final auction prices.

5. Auctions should be properly designed with low reserve prices

Auctions are an effective means of assigning new spectrum when demand is expected to exceed supply. Effectively designing an auction depends on market conditions and the objectives of governments and regulators, but above all, it is the conditions of the auction (reserve prices and obligations through terms and conditions) rather than the methodology that determines success.

For governments setting spectrum policy, key considerations include maximising long-term economic and social value, ensuring efficient implementation, supporting investment in networks and services, maintaining a viable market, and delivering a fair and transparent assignment process. Regulators are required to balance the objectives of efficient spectrum assignment and support competition in communications markets. Seeking to maximise auction revenues undermines network investment and thus can have a negative impact on the benefits that are realised by society, and the digital economy.

Regulators rely on reserve prices in auctions to limit frivolous or strategic bidding. However, reserve prices are also frequently seen as a mechanism to increase revenue from the auction and become a potential factor driving spectrum prices.

In many cases, reserve prices are set based on historical prices for spectrum, which can be an invalid reference for its current value to operators (as shown above), considering the overarching trend of lower per-MHz values of spectrum due to the backdrop of larger spectrum volumes being purchased. In these instances, reserve prices often become final prices and do not allow for price discovery. They therefore increase the prices paid by operators due to the administrative decision of the reserve price level, not the price set by the market.

The effect of reserve prices elevating the cost can be detrimental because operators face uncertainty about the true value of spectrum from a commercial perspective. When reserve prices become final prices, they can amplify the effect of the “winner’s curse”, where an operator overvalues spectrum and becomes the sole bidder acquiring spectrum at a high reserve price, rather than the lower price offered by other bidders.

Reserve prices should ultimately be set carefully to maintain the price discovery function of the auction. Competitive bidding will then ensure fair prices.



6. Longer spectrum validity and certainty of licence renewal encourage long-term network investment

Long-term licences with certainty of renewal are seen as best practice in leading markets. Clear and timely spectrum renewal decisions are essential for the long-term development of mobile networks. Spectrum licences underpin how mobile services are delivered, from basic connectivity to advanced capabilities, and uncertainty over renewal can undermine effective planning. As such, several markets are considering or adopting longer spectrum terms, including licence periods that extend up to 30 or 40 years. Policymakers should consider similar approaches for access to spectrum, including existing holdings, so that spectrum validity better reflects the time required for network deployment, ecosystem development and service monetisation.

MNOs face heightened regulatory risk when renewal decisions are ambiguous, which can discourage investment and lead to slow or suboptimal network upgrades years before the licence expiry. A defined renewal framework, communicated in advance of licence expiry, with adjusted spectrum prices that reflect current market and technology realities, supports continuity of service and ongoing network improvement.

Renewal processes can also be used as an opportunity to offset historically high prices paid for spectrum by assuring licence holders of their investments. For example, if automatic low-cost renewals are implemented in Europe, it could save up to €330 billion in spectrum costs over the next 10 years, improving the viability of further network investment. Furthermore, renewing licences at no cost could increase network

speeds by up to 23% and generate up to €75 billion in Europe's GDP by 2035.

Mobile operators make decisions on network densification, rural expansion and technology upgrades based on confidence that they will retain access to spectrum long enough to realise a return on investment. Longer licence terms are particularly important where ecosystems and use cases are still developing, supporting investment, innovation and the introduction of new services. They also facilitate spectrum refarming and technology evolution, while shorter terms can reduce investment incentives and limit flexibility for future network upgrades. Renewal uncertainty should be avoided as it can delay investment, increase financing costs and encourage more cautious deployment strategies.

A decision not to renew a spectrum licence should be taken only in exceptional circumstances. Removing spectrum from existing mobile services risks service disruption, stranded assets and foregone investment, all of which impose real costs on consumers and the wider economy. Non-renewal should therefore be considered only where there is a clear case that reassigning the spectrum would deliver benefits that demonstrably exceed these costs. Existing mechanisms such as trading can provide flexibility for spectrum management, while preserving the benefits of longer-term certainty for investment, network quality and consumers. However, trading may be discouraged and spectrum used inefficiently when recurring fees are introduced.

7. The cost of meeting obligations or investment commitments attached to licences should be reflected in their price

The appropriateness of obligations varies between markets, and careful consideration is required to ascertain whether they will increase the quality and reach of mobile broadband compared to market-led approaches.

Obligations are often seen as a way of improving universal access, but they can mandate a higher level of service compared to what an operator would be incentivised to deploy by commercial considerations. For example, mandating coverage in rural areas where it would not have otherwise been financially viable to do so. Meeting such obligations is costly to operators as the investment and operating costs outweigh the potential revenue gain. Because of this, obligations affect licence value to operators.

Regulators should account for any set of obligations in spectrum pricing, ensuring fees reflect the associated costs to operators. Other market-based mechanisms can also be used, such as a reverse auction for optional obligations.

Obligations should be made clear prior to the auction or assignment process so that operators can develop a viable business case. While lower auction prices can be used to offset obligations, they should reflect the cost of complying with those obligations, so that the financial burden on operators does not exceed the value of the discount provided.

A common example of strenuous conditions being applied is to maximise rural coverage. Measures that improve the commercial viability of extending coverage are more likely to be achieved, and at lower cost, than seeking to enforce licence obligations. These include:

- Releasing spectrum in lower frequency bands
- Allowing for network and voluntary spectrum sharing
- Earmarking auction proceeds to subsidise improved coverage
- Removing or minimising mobile-specific taxes and charges.

In some instances, regulators have consulted with operators to understand how service quality targets can be extended efficiently. This is the case of the UK, where the regulator decided to forgo the plans to attach obligations to spectrum licences in favour of a joint commitment by operators to build a shared rural network. In other countries, such as France, consultation with operators led the regulator to renew licences at no additional cost in exchange for a commitment to expand networks to underserved areas (see policy in practice section below).



Policy in practice

Vietnam

Vietnam's 2024 spectrum auction, led by the Authority of Radio Frequency Management, successfully assigned key mid-band frequencies in the 2.6 GHz and 3.5 GHz bands to drive 5G deployment. The auction was designed to deliver impact via spectrum prices at levels considered sustainable for operators, helping to ensure that spectrum cost supported network investment.

This pricing strategy contributed to rapid network expansion and improved performance. Operators were able to deploy 5G at scale using large, contiguous spectrum blocks, supported by deployment incentives. Within a year of launch, Vietnam recorded a significant increase in average mobile speeds, indicating progress in network quality and coverage.

The 2026 multi-band spectrum auction increased the amount of spectrum available for mobile services and provided a clearer basis for future network development, including 5G. A total of 480 MHz was assigned across several bands to three operators. This raised overall spectrum availability to over 750 MHz and was significantly higher than previous levels, which had been low compared to regional benchmarks.

"The inclusion of phased coverage and quality obligations also places a focus on gradual network expansion and service improvement over time."

Pakistan

In 2026 Pakistan's Ministry of Information Technology and Telecommunication (MoITT) and the Pakistan Telecommunication Authority (PTA) took a fresh and market-focused approach to its latest spectrum auction. Auctions in Pakistan have historically had high reserve prices, leading to limited interest which has contributed to slower 4G rollout and adoption.

The PTA's measured policy approach will support investment. Spectrum was offered across multiple bands, reserve prices were set at more moderate levels, and payments were denominated in local currency to reduce financial uncertainty. The inclusion of phased coverage and quality obligations also places a focus on gradual network expansion and service improvement over time.



France

In 2018, French regulator Arcep took a different approach to renewing licences for the 900, 1800 and 2100 MHz bands that were due to expire between 2021 and 2024. Given the regulator's concerns over low availability of 4G in rural areas, Arcep agreed with operators to trade the licence renewal fee for the acceleration of 4G rollout and provide "nationwide, high-quality mobile coverage for everyone in France".

The government and local authorities identified areas that needed improved coverage to bolster regional development. The commitments included providing mobile coverage in selected "white zones", accelerating the pace of transport corridor coverage and improving reception quality nationwide, particularly in rural areas.

"After five years, the share of the population covered by 4G across all four operators had almost doubled."

The regulator tracked operator progress and found that, after five years, the share of the population covered by 4G across all four operators had almost doubled (from 45% to 88%) and the share living outside of a 4G network had declined from 20% to 11%. Furthermore, almost two-thirds of the population had access to 30 Mbps services or higher (up from 37%). Consumers and businesses across France have benefited from significantly improved 4G and 5G services across the country by placing more value on the long-term social and economic benefits that are driven by increased coverage and network quality than short-term revenue gains.

Spain

The Spanish government, seeking to align domestic regulation with the European Electronic Communications Code (EECC), commissioned a review of licence renewals. Based on the findings, all existing licences were extended by 10 years, up to a maximum of 40 years since the date of the first award. No additional costs, obligations or charges were involved, beyond the continued payment of existing annual fees.

"The review found no alternative spectrum uses that could deliver greater or similar socioeconomic benefits."

The review found no alternative spectrum uses that could deliver greater or similar socioeconomic benefits. Extension ensured the most efficient use of spectrum while minimising administrative costs. The government expected that cost-free renewal will mean "savings of hundreds of millions of euros for operators, which can be invested directly in deployment and innovation". Beyond cost savings, licence extensions provide certainty of access, enabling long-term investment planning. This is particularly important for bands expiring before 2030 that are likely to be refarmed for 5G, which reached 91% population coverage in Spain in 2024.

Trinidad and Tobago

The Telecommunications Authority of Trinidad and Tobago (TATT) has adopted an evidence-based approach to spectrum pricing to support investment in advanced networks amidst economic uncertainty and within a small island context. Drawing on established costing methodologies, international benchmarks and domestic market analysis, TATT applied a combination of business intelligence and econometric modelling, with tiered discounting where appropriate, to ensure that spectrum prices reflect economic value while enabling adoption of technologies including 5G and advanced satellite services.

This approach is being applied in the design of 5G licences in the 2.5 GHz and 3.5 GHz bands, where a discounted cash flow model is used to estimate the upper bound of spectrum valuation, complemented by benchmarking of comparable auctions to inform lower bound estimates.

Together, these inputs are establishing a realistic pricing range and a representative reserve price, aimed at promoting participation, supporting sustainable investment and maximising overall societal value from spectrum resources.

