GSMA Intelligence

The cost of removing designated third-country vendors from EU telecoms networks

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GSMA Intelligence

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About this study

This GSMA Intelligence study is independently commissioned and sponsored by seven European telecoms operator groups – Deutsche Telekom, Fastweb, MEO, Orange, Telefónica, United Group and Vodafone. GSMA Intelligence carried out this work on behalf of the sponsors based on a limited dataset provided by third parties. The report is only intended as a high-level assessment of the economic costs, and all extrapolations, models and conclusions are those of GSMA Intelligence as an independent research provider and not those of the GSMA.

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Executive summary

The proposed exclusion of designated third-country vendors (so-called high-risk vendors, or HRVs) from EU telecoms networks under the EU Cybersecurity Act (CSA2) aims to strengthen network security. However, mandatory removal of HRV equipment would impose substantial direct costs on operators, reduce competition in network equipment markets and likely slow the development of Europe's digital infrastructure.

Direct costs of rip and replace: €30–40 billion

Replacing HRV equipment across EU mobile, fixed and transport networks would cost operators €30–40 billion (with a central estimate at €35 billion). This estimate is based on data from operators representing almost half of the EU market, aggregated and extrapolated to estimate costs and price impacts across the EU. GSMA Intelligence estimates costs in the following network areas:

- **Mobile networks:** €16–22 billion (€30–42 per mobile connection), driven by high exposure to HRV equipment and the cost of replacing equipment such as base stations.
- **Fixed networks:** up to €5.0 billion (€28–29 per fixed connection) for fibre terminals, gateways and fixed wireless equipment.
- **Transport networks:** €9–12 billion (€12–16 per connection) for optical switches, multiplexers and amplifiers.

These figures cover only direct equipment replacement and exclude write-offs of existing assets, disruption costs, capacity constraints and broader impacts on future investment plans.

Higher equipment prices from reduced competition

Excluding high-risk vendors could increase concentration among remaining suppliers and reduce competitive pressure, leading to the following estimated price increases:

- 24% in mobile network equipment
- 19% in fixed network equipment
- 10% in transport network equipment.

In segments such as optical links and microwave connections, where only one or two major suppliers would remain, price increases could be even greater.

These price effects would raise operators' investment costs. Planned investment in physical active equipment subject to the restrictions totals nearly €42 billion over 2027–2030. The estimated price rises imply an additional cost of around €8.5 billion over the period, concentrated in mobile networks. For the 2027–2035 horizon, cumulative additional investment costs could reach approximately €24 billion (€19 billion for mobile, €3 billion for fixed and €2 billion for transport).

Furthermore, replacement mobile radio network (RAN) equipment is expected to be less energy efficient than existing equipment (like-for-like, considering the entire lifespan). While these costs have not been quantified in the study, feedback from surveyed operators suggests they could be substantial.

Although outside the scope of this study, operators have highlighted that, notwithstanding the costs involved, the extremely tight timelines proposed to remove HRV from RAN are also likely to create significant disruption to services for users and risks to network resilience.

Economic trade-offs and Europe's investment gap

The combined effects of higher replacement costs, elevated equipment prices and increased operating costs would place further pressure on operators' already constrained investment capacity, with reduced or delayed network investment the more likely response. This would slow network modernisation, delay 5G standalone and fibre deployment, and weaken progress towards Europe's digital connectivity objectives.

Wider economic consequences could be material. High-quality connectivity underpins productivity, innovation and competitiveness across manufacturing, logistics, healthcare and public services. Slower deployment of advanced networks would therefore dampen broader economic performance.

These impacts are particularly significant as Europe already faces a large digital infrastructure investment gap. Around €475 billion is required to deliver best-in-class connectivity, but only around €270 billion is currently expected, leaving a shortfall of €205 billion. Additional regulatory cost burdens risk further widening this gap.

Figure 1: Direct impacts of HRV exclusion in the EU

Source: GSMA Intelligence

	Cost of rip-and-replace for existing equipment	Increase in equipment prices due to lower vendor competition	Incremental cost pressure on operators' 2027–2030 investment
Mobile networks Radio access networks, mobile core functions, virtualisation, service platforms, management systems	€16–22 billion	+24%	€6.6 billion
Fixed networks Storage, fixed wireless access, CMTS, OLTs and DSLAMs, AAA, service platforms and management systems	Up to €5 billion	+19%	€1.1 billion
Transport networks High-capacity transponders, subsea cables, optical and microwave links and IP networks	€9–12 billion	+10%	€0.8 billion
Total	**€30–40 billion**		**€8.5 billion**

1. Introduction: a robust evidence base to support policy discussion

Europe's telecoms networks are undergoing a period of structural change. As digital infrastructure becomes increasingly central to key economic and social outcomes, policymakers are placing a greater emphasis on security and resilience.

A key development in this context is the European Commission's proposal to strengthen cybersecurity requirements through an updated regulatory framework, referred to as CSA2.[1] This includes provisions that require the removal of critical equipment supplied by designated HRVs from telecoms infrastructure within a defined timeframe.

The proposed measures would apply across both mobile and fixed networks, as well as associated transport infrastructure. If implemented, they would represent one of the most significant structural interventions in the European telecoms sector in decades.

While the policy objective to enhance network security is clearly defined, there is limited public evidence on the broader economic implications of such measures. Estimates of the economic cost of the measure range widely – from the €3–4 billion annually for mobile networks over a three-year period initially estimated by the European Commission, to more than €57 billion estimated by CCCEU-KPMG.[2]

Questions remain regarding the scale of costs associated with replacing HRV equipment, the operational complexity of large-scale equipment replacement, and the potential effects on market competition levels and the pricing strategies of remaining vendors.

GSMA Intelligence has conducted unique research to assess the cost of removing critical components from HRVs from European telecoms networks, with a view to providing a robust evidence base to support policy and industry discussions.

The study is based on information provided by European telecoms operator groups to GSMA Intelligence. This was aggregated and extrapolated to estimate costs and price impacts across the EU. This evidence is critical to enable an evaluation of the trade-offs involved in policy interventions, and achieve the intended objectives while maintaining the long-term sustainability of telecoms networks.

[1] Proposal for a Regulation for the EU Cybersecurity Act, European Commission, 2026
[2] A Huge Cost of "Guardrails": Security or Blockade? Economic Impact Assessment of EU CSA2 Proposal and the CCCEU Position Paper, CCCEU-KPMG, 2026

2. CSA2: key implications for EU telecoms operators

The European Commission's proposed revision of the Cybersecurity Act (CSA2), published in January 2026, represents a significant evolution of the EU's cybersecurity framework. It involves shifting from a certification-based approach to a broader system that incorporates non-technical risks. Under the framework, the European Commission can identify "key ICT assets" in critical sectors, assess risks and impose mitigating measures (including mandatory removal of equipment) through coordinated, EU-level processes. The assessments consider both technical vulnerabilities and broader structural factors, including supplier concentration and dependencies on third-country vendors.

CSA2 also introduces, for the first time, an EU-level timeline: a mandatory phase-out of high-risk vendors from 5G core and RAN networks within three years of the CSA passing into law.

The legislative proposal identifies core, mobile access, fixed access and transport networks as "key ICT assets" and mandates removal of equipment provided by high-risk vendors from these networks. Restrictions on high-risk vendors under CSA2 will have material financial implications for operators, including direct costs to replace and install equipment, and increased concentration in the vendor market.

The European Commission has not produced a detailed, bottom-up estimate of the costs of removing high-risk vendors. Indicative figures referenced in the CSA2 Impact Assessment suggest an annual cost of €3–4 billion for mobile networks for a three-year period in total.[3] However, these figures are not based on operator data, have not been independently validated, and relate to mobile networks only. For fixed networks, despite these being in scope of the proposed rip and replace, an impact assessment is missing.

More recently, KPMG, in collaboration with the China Chamber of Commerce to the EU (CCCEU), provided a more significant estimate of the potential economic impact of the proposed CSA2.[4] The study estimates that, if implemented, the provisions could generate cumulative economic losses of €367–370 billion across the EU over a five-year horizon (2026–2030), driven by a combination of direct replacement costs, broader system impacts and wider economic spillover. The telecoms sector is identified as one of the most affected components of the digital economy. The study estimates total losses of around €57.4 billion for telecoms operators and related activities over the assessment period, making it one of the most exposed sectors (accounting for 16% of the overall impact).

[3] Proposal for a Regulation for the EU Cybersecurity Act, European Commission, 2026
[4] A Huge Cost of "Guardrails": Security or Blockade? Economic Impact Assessment of EU CSA2 Proposal and the CCCEU Position Paper, CCCEU-KPMG, 2026

While the policy objective to enhance network security is clearly defined, limited public evidence exists on the broader economic implications of such measures. In particular, questions remain regarding the scale of costs associated with replacing HRV equipment, the operational complexity of large-scale equipment replacement, and the potential effects on market competition and vendor diversity. Addressing these questions is the main objective of this report.

3. The cost of rip and replace

GSMA Intelligence conducted a survey of seven EU operator groups that performed internal assessments on the cost of replacing HRV equipment in their EU-based mobile, fixed and transport operations. In compliance with competition laws, the data has been aggregated to provide only key headline metrics based on reported averages across operator groups.

How the cost of replacing HRV equipment across the EU is estimated

GSMA Intelligence collected estimated replacement costs from seven EU operator groups accounting for nearly half of all mobile market connections in the EU and a similar share of fixed broadband connections. The groups/operators include Deutsche Telekom, Fastweb, MEO, Orange, Telefónica, United Group and Vodafone. Taking a consistent set of equipment and following a harmonised approach, operators individually undertook the task of estimating the costs of replacing the different network areas subject to restrictions on HRV equipment proposed under CSA2, including:

- Mobile networks, with cost based on core and radio access networks, mobile core functions (virtualisation infrastructure and similar), service platforms and management systems, but excluding passive areas not subject to restrictions, such as passive antennas, batteries and cabinets. These assumptions are conservative, as some of the passive components are an integral part of RAN deployment and would also need to be replaced.
- Fixed networks, with HRV equipment replacement cost based on DNS, storage, fixed wireless access, CMTS, OLTs and DSLAMs, AAA, service platforms and management systems, but excluding passive infrastructure.
- Transport networks, with replacement cost based on subsea cable equipment, aggregators, optical line systems and capacity transponders, IP networks, microwave links and CGNAT.

The costs capture those involved in the installation and procurement of new equipment but exclude the net book value of HRV equipment at write-off.

Data provided to GSMA Intelligence was aggregated to compile key metrics, such as the cost of replacement per connection. To extrapolate the cost of replacement to the remaining (non-surveyed) EU operators, two approaches were taken:

Lower-bound approach

This relies on GSMA Intelligence Network Tracker[5] data to assess whether an operator has HRV equipment active in their mobile network that would require replacing. We

[5] A proprietary GSMA Intelligence database covering mobile network deployments worldwide, tracking live, planned and trial networks by operator, technology and vendor, based on operator disclosures and analyst verification. It is used to monitor global rollout trends and network evolution.

assume that non-surveyed operators will incur no replacement costs, unless an operator launched a network in the last 10 years using at least one HRV as a supplier. If that is the case, we assume their replacement cost per connection will be the same as the arithmetic average for operators that supplied data. For operators where network vendor data for networks launched in the past 10 years is missing, we assume replacement cost per connection equal to the average of all operators with network vendor data.[6] Because network vendor information is missing for some networks, this approach is likely to under-identify HRV exposure. This approach therefore results in a lower-bound cost estimate.

We apply the same lower-bound approaches to calculate replacement costs in fixed and transport network areas. In the lower-bound approach, we assume that operators who rely on HRV equipment in their mobile networks also rely on HRV equipment in their fixed and transport networks, and assume fixed replacement cost per connection accordingly based on whether an operator has been flagged to have HRV equipment.

In many EU countries, local regulations restricting the use of HRV equipment have predominantly applied to mobile networks, and to a lesser extent to fixed and transport equipment. Our approach of flagging exposure based solely on mobile vendor information will therefore tend to under-identify exposure to HRV equipment in fixed and transport area networks. This further sets the lower-bound approach as likely to identify a lower-end cost estimate of rip and replace in the fixed and transport network areas.

Upper-bound approach

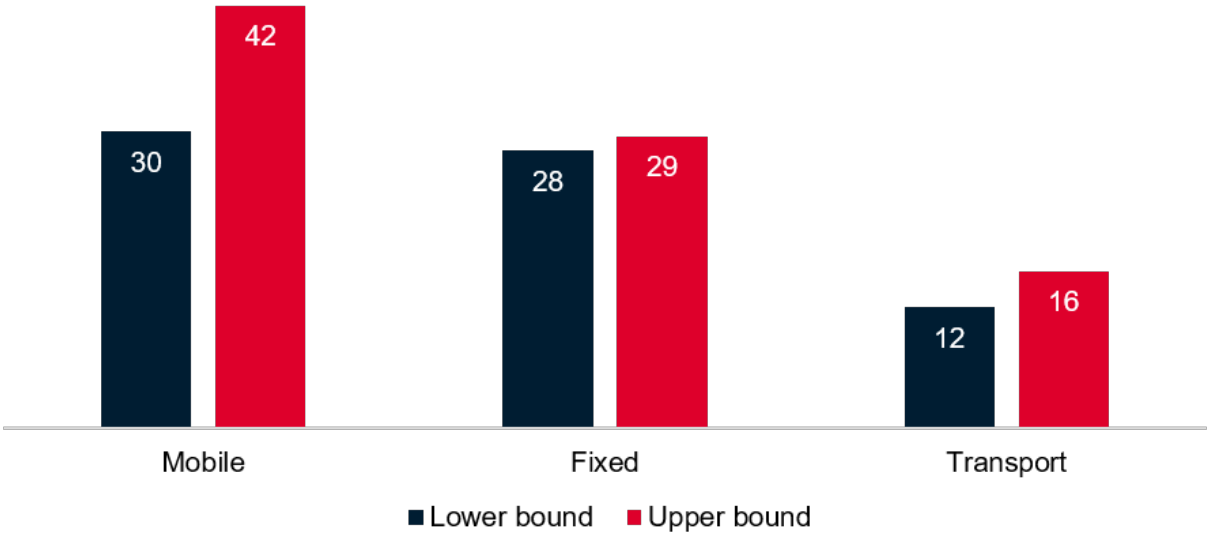
Under this scenario, the average surveyed replacement cost per connection is extrapolated to the population of remaining non-surveyed EU operators. Non-surveyed operators will include some with no HRV exposure but may also include other operators that have more HRV exposure than nearly half the market we gathered data for (and which also includes group operations with no HRV exposure). We consider this scenario to be an upper-bound estimate of the total cost of replacement. Our network database suggests a more common presence of HRV equipment among surveyed operators (71% launched a network using HRV equipment in the past 10 years), compared to non-surveyed operators (51%). This does not reflect vendor market share, just the presence of HRVs in networks. Uncertainty therefore remains as to whether exposure is higher among surveyed operators. We apply the same upper-bound approach to the extrapolation of fixed and transport replacement costs (assuming the same cost per connection as among surveyed operators).

Extrapolations based on lower-bound and upper-bound approaches show that EU-wide, average replacement cost per connection ranges from €30 to €42 for mobile networks, €28 to €29 for fixed networks and €12 to €16 for transport networks.[7]

[6] For fixed and transport networks, we follow a consistent approach. If there is no evidence of the operator having HRV equipment in their mobile networks, we assume no HRV equipment on their fixed and transport networks, and the other way around.
[7] Per-connection cost in transport networks is calculated on the basis of combined fixed and mobile connections.

Figure 2 Average per-connection cost of replacing HRV equipment in EU networks

Source: GSMA Intelligence analysis of operator data



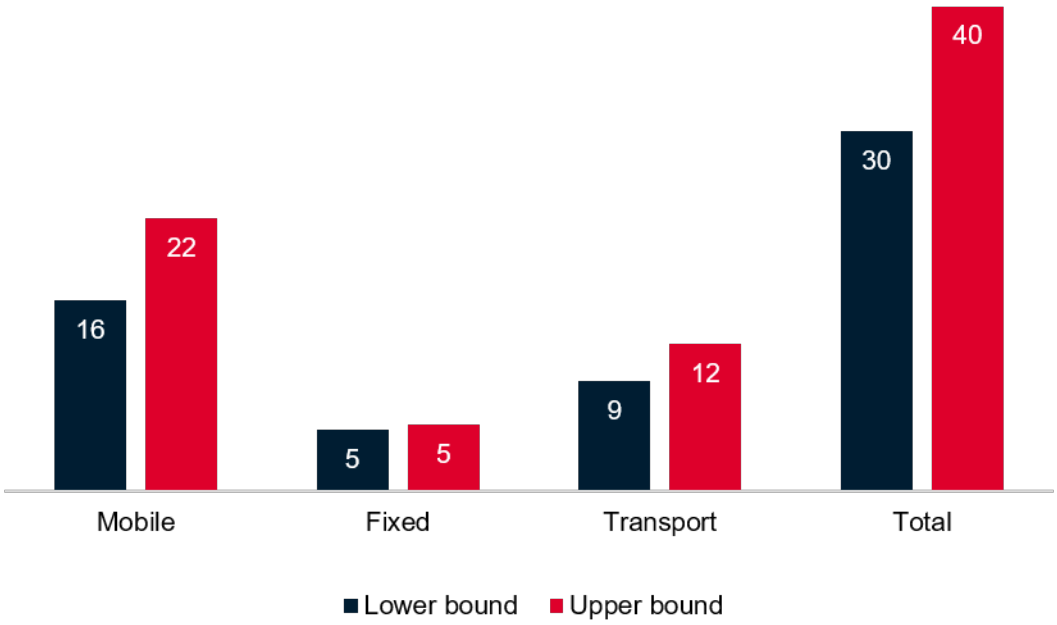
Replacing HRV equipment in EU networks could mean €30–40 billion of additional cost for network operators

The aggregate cost of replacing HRV equipment stands at between €30 billion for the lower-bound estimate to €40 billion for the upper-bound estimate (Figure 3). Most of the cost is linked to mobile networks, given the more than 500 million connections in the EU and the highest cost per connection. The estimated cost for fixed networks is around €5 billion (excluding CPEs) and between €9 billion and €12 billion for transport networks. A central cost estimate could be taken as a mid-point between the lower-bound and upper-bound variants, implying €35 billion in rip-and-replace costs alone, of which €19 billion would be due to mobile networks, €5 billion for fixed infrastructure and €11 billion for transport elements.

Figure 3: Cost of replacing HRV equipment in EU networks

Source: GSMA Intelligence analysis of operator data

Cost (€ billion)



4. The impact on network equipment pricing

The ban on HRVs will reduce competition among vendors and increase equipment prices

The EU's ongoing initiatives to restrict or ban HRVs from critical telecoms infrastructure represent a significant intervention in the vendor market that will reduce competition among vendors without any pro-competitive elements. The measures will materially reduce the number of viable equipment suppliers available to European network operators. Economic theory suggests the result will be higher market concentration, diminished competitive pressure and sustained upward pressure on prices for network equipment and, ultimately, connectivity services.

In classic standard microeconomic theory, the relationship between market structure and pricing is generally considered to be well established within the frame of static effects. The telecoms equipment market is characterised by high concentration, where high fixed costs, economies of scale and technological complexity create significant barriers to entry. This results in a limited number of competitors globally.

By removing HRVs, the policy effectively "merges" market share into the hands of the surviving vendors through default substitution.

As the task here is to focus on assessing such potential static price effects following the exclusion of HRVs from the market for equipment provision, we follow the traditional approach of the European Commission based solely on static effects, which is under review, to assess horizontal mergers and the related loss of direct competitive constraints between merging parties.[8] This analysis typically relies on diversion ratios, which measure the proportion of sales lost by one firm that would be captured by the other in response to a price increase. These diversion patterns are then combined with information on margins to derive indicators of upward pricing pressure, such as the Indicative Price Rise (IPR) metric. IPR provides an economic screening tool to assess whether the merged entity would have an incentive to raise prices after the merger by internalising diverted sales between the merging firms.

Using these economic frameworks, the likely impact on network equipment prices can be analysed across three areas: mobile, fixed and transport networks. Indicative price rises can be inferred from how:

- the remaining vendors will capture additional market share (diversion ratios)

[8] While these static tools are widely used as an initial screening tool in merger assessment, it has well-recognised limitations. It provides a measure of unilateral pricing incentives immediately following a merger but does not constitute a prediction of actual price effects. It abstracts from several important competitive dynamics, including efficiencies, repositioning by competitors, entry and expansion, capacity constraints, multi-product interactions, and longer-term strategic responses. Consequently, economic literature generally views this only as an indicative screening metric.

- increasing concentration leads to a different optimal pricing approach, favouring increased prices as a profit-maximising, optimal response from the remaining vendors (indicative price rise).

Figure 4: Impact of HRV restrictions on competition and equipment pricing

Source GSMA Intelligence

The exclusion of HRVs from the European telecoms network equipment market represents an exogenous regulatory intervention that directly alters the structure of the upstream vendor market. By removing important suppliers from operators' choice sets, the measure forces demand towards the remaining vendors, leading to a very sharp increase in concentration, even creating local monopolies in specific locations of the value chain, reducing procurement alternatives. In such specific circumstances, an IPR framework is used as a first-order tool for assessing the potential effect of such a reduction in the variety of procurement on network equipment prices, which in turn will act as a supply constraint on the telecoms operators.

Furthermore, the static effects from regulatory-induced vendor exclusion will in turn have negative effects on the capacity of telecoms operators to invest in and deliver the full potential in terms of network coverage and quality. Although a static approach is applied to assess the price effect of vendor exclusion in the market for equipment provision, which is already concentrated, such a standard methodology would not accurately capture the full range of competitive effects of mobile mergers, where related rises in market concentration are typically measured against a broader economic context that includes dynamic efficiencies, network integration, investment incentives, spectrum use, capacity expansion, coverage and quality improvements, and long-term dynamic competition.

While IPR is informative in the HRV-removal context (where the mechanism is the forced reduction of supplier choice), it is not an appropriate standalone framework for assessing the effects of a mobile merger.

Estimates show network equipment price increases of up to 24%

GSMA Intelligence estimates show that the ban on HRVs in the EU will have a substantial impact on market concentration and network equipment prices (Figure 5).

- Given the already high level of concentration in the mobile network equipment market and the large current share of HRVs in the EU market, the exclusion of HRVs could lead to an estimated price rise of 24% by the remaining vendors (weighted average).
- HRVs currently command a high share of the fixed equipment market. However, owing to lower overall market concentration, their exclusion would lead to a slightly lower price rise, estimated at 19%.
- Transport equipment sees the lowest overall current concentration, with the HRV share estimated at about 28%. However, their exclusion will increase transport network equipment prices by 10%.

It is important to note that price increases may be even higher. While we characterise competition in mobile, fixed and transport markets, exclusion of HRVs would mean that in specific market segments, such as optical links or microwave connections, only one or two major players would remain. In such specific segments with markedly greater concentration and limited substitutability, the indicative price increase would likely be higher (see *Price impacts in specific network equipment segments*).

Figure 5: Impact of HRV exclusion on market concentration and indicative price rise

Source: GSMA Intelligence

	Market concentration index (HHI)		Market concentration increase (HHI)	Indicative price rise
	Before exclusion	After exclusion		
Mobile	2,901	4,816	+66%	24%
Fixed	1,947	3,043	+56%	19%
Transport	1,538	2,057	+34%	10%

These indicative price increases could be higher if all current HRV sales are diverted to the largest remaining player – due to scaling constraints among smaller providers, for example. Under this assumption, prices in mobile could increase by 43%, by 45% in fixed, and by 16% in transport. Additionally, price effects could likely be higher in specific market segments where competition will be confined to even fewer market players.

Price impacts in specific network equipment segments

While this analysis divides network equipment markets into mobile, fixed and transport infrastructure, the markets could be further divided into segments. For example, transport infrastructure includes segments such as microwave links used in backhaul wireless connections from base stations, optical links for high-capacity core networks, and optical subsea cables used to connect continents. As in many cases substitution between these network elements is typically near-impossible, these could be treated as separate markets, narrowing the definition of the market and number of competing players, resulting in even greater price increases following the exit of HRVs. While market intelligence specific to EU markets is limited, examples of fixed and transport network equipment market segments where the exclusion of HRVs would leave one or two major players include the following:

- In the global passive optical network equipment market, three HRVs account for 70% of market share.[9] Their exit would likely leave only one large supplier (Nokia).
- In the market for microwave links used for high-capacity connections to transmit data from mobile base stations or link enterprises, restrictions on HRVs would leave a single largest player (Ericsson), followed by a much smaller runner-up (Nokia), with much smaller shares for other, specialised players.[10] This would largely emulate the market structure post-HRV exit in the mobile market, hence the expected price increases could be of similar magnitude – close to 25% when evaluated using an IPR methodology.

The headline price effects are therefore estimated on the basis of a broad definition of markets and increased number of market players. However, the price effects in specific segments due to the exclusion of HRVs could be even higher, resulting in amplified effects in terms of slower network deployment and worse consumer outcomes for years to come.

An increase in network equipment prices following HRV exclusion could mean billions of euros of additional cost imposed on EU network operators

GSMA Intelligence estimates a marked increase in investment cost faced by EU operators as a result of HRV exclusion. The baseline forecast shows planned cumulative 2027–2030 investment in physical network equipment subject to HRV exclusion (i.e. active equipment components) at nearly €42 billion, with most of the investment (€27.5 billion) expected in the area of mobile infrastructure, followed by €5.8 billion in fixed networks and €8.3 billion in transport networks.

The exclusion of HRVs and the subsequent price increases that could follow could mean that the same scale of investment would be linked to an incremental cost to operators of €8.5 billion. Most of this cost arises in mobile networks, with an estimated €6.6 billion of additional cost. Exclusion of

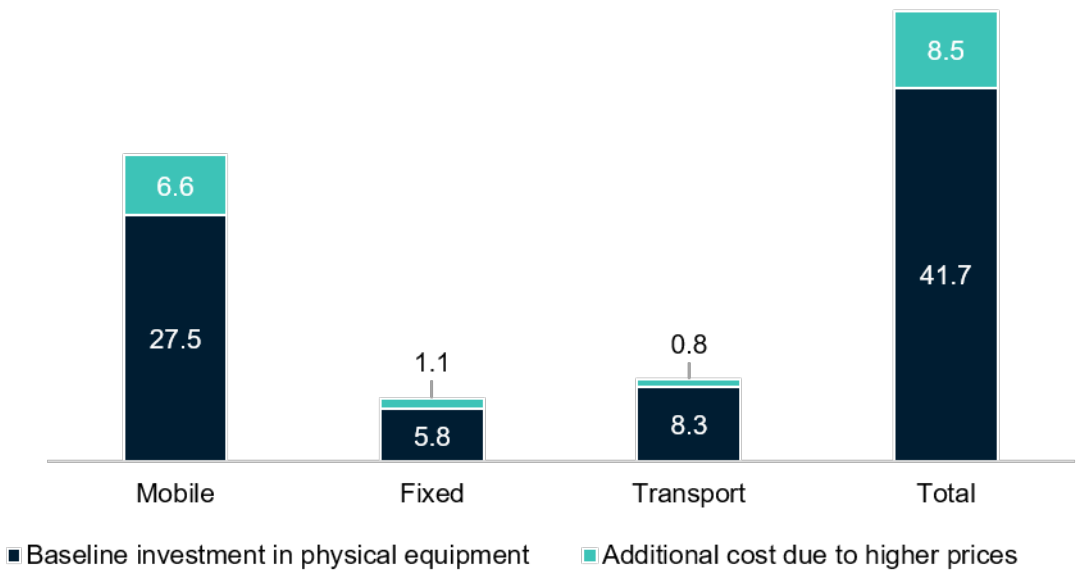
[9] "Huawei bans leave fiber operators with little choice besides Nokia", Lightreading.com, May 2026
[10] "Microwave Transmission Equipment Market Flattens Out in 2025, According to Dell'Oro Group", Dell'Oro, February 2026

HRVs would also lead network operators to face additional costs in the areas of fixed and transport infrastructure, at €1.1 billion and €800 million respectively.

These figures concern only the immediate 2027–2030 period. However, the impact on pricing due to reduced competition will be lasting. While uncertainty about diversion and levels of competition increase when the modelling period is extended, the cumulative 2027–2035 cost impact could amount to €24 billion, with €19 billion arising in mobile, €3 billion in fixed and €2 billion in transport.

Figure 6: Planned 2027–2030 investment in physical active equipment and estimated incremental cost due to higher prices

Source: GSMA Intelligence estimates



How the future impact on investment cost in telecoms networks is estimated

The baseline GSMA Intelligence projection of investment and the impact on investment cost is based on the following:

- For mobile networks, we developed operator-level projections of capex based on past data and forecasting techniques, taking into account various market factors.
- For fixed network investment, we calculated average 2025 capex per connection in fixed infrastructure based on data provided by the surveyed operator groups. We projected average fixed capex per connection into the future assuming it will follow the same growth rate as average mobile capex per connection.
- Similarly, for transport networks, we used data provided by surveyed operators to calculate average transport capex per connection (combined fixed and mobile connections). We projected it forward, assuming the same growth rate as for mobile capex per connection.

We assume that the future cost pressure will apply only to purchases of active physical equipment subject to CSA2 restrictions. Hence, the indicative price rise parameters were applied only to the fraction of future investment in equipment that is subject to CSA2 restrictions.

The calculation of indicative price rise relied on:

- the current market share of both HRVs and non-HRV players in each of the mobile, fixed and transport markets affected by CSA2 restrictions
- their gross profit margins derived from market intelligence and financial reports (summarised in the Appendix).

We applied the IPR formula with the assumption that all the current HRV sales will be captured by the remaining vendors in proportion to their current market share.[11]

Given the characteristics of the market, with few remaining equipment suppliers but multiple operators (and groups) in the EU alone and many more globally, operators will not be able to exercise buying power to bargain against price increases.

[11] Mergers with Differentiated Products, Shapiro, 2014

Facing additional costs, network operators will review their investment and market strategies to ensure financial viability. Their response could lead to the following:

- **Higher prices** – The cost pass-through effect is an established relationship between the increase in production costs and consumer prices. Given the high degree of price competition and declining revenues per user, it is unlikely that operators can pass on much of these price increases.

- **Slower network modernisation and lower network quality** – Given the limited ability to increase prices, most of the cost effect will result in scaled down investment and lower quality services (against a no HRV exclusion baseline). Operators will cancel deployment and upgrade projects in areas where the expected return on investment becomes negative due to a higher upfront cost (with 10–24% higher prices of active network components). This will translate into slower network speeds and delayed deployment of 5G standalone and fibre networks.[12] In other words, operators are unlikely to offset the price difference with higher investment. Instead, they will scale down investment to compensate for higher equipment prices. Hence, the ramifications can also be expressed as a reduction in a real-terms investment in proportion to equipment price increases.

Additional operational and environmental costs

The rip-and-replace requirement brings a direct environmental cost due to tonnes of equipment waste. Under similar schemes in the US and UK, operators were ordered to destroy and dispose of network equipment, resulting in further environmental costs.

GSMA Intelligence's survey of operators indicates that additional impacts will arise as a result of a loss in the energy efficiency advantage that some of the mobile network HRV equipment offers. While the specific energy efficiency advantage could vary among specific vendors and equipment generations, the survey results show operators expect replacing their current RAN equipment with like-for-like hardware from alternative vendors would result in a significant increase in energy consumption.

[12] A previous study in the area of fixed networks suggests a pass-through rate of between 80% and 100%, meaning that nearly all the increase in production cost (copper price shock) in New Zealand was eventually passed on in the form of higher prices or lower service quality.

5. Conclusions: strengthening security, navigating trade-offs

As Europe advances its digital transformation agenda, ensuring the security and resilience of telecoms networks is a policy priority. However, large-scale regulatory interventions such as the removal of HRV components have wide-ranging implications for investment, competition and network development.

This study addresses a critical evidence gap by providing a structured, data-driven assessment of these impacts across European telecoms networks. By combining operator inputs with robust analytical methods, the study offers a comprehensive view of the economic and operational consequences of restrictions on HRV equipment.

The findings are intended to support balanced, informed dialogue across the ecosystem, helping policymakers and industry stakeholders navigate the trade-offs inherent in strengthening network security while sustaining long-term investment and innovation.

Exclusion of HRVs from EU networks will have substantial direct effects

The exclusion of HRVs from EU telecoms networks under current proposals carries substantial economy-wide implications that extend far beyond security considerations. GSMA Intelligence estimates indicate that a comprehensive EU-wide exclusion could result in the following:

- A direct cost of rip and replace of between €30–40 billion to remove HRV equipment from critical network areas outlined in the proposals.
- A direct future cost due to lower levels of competition in the mobile, fixed and transport network equipment markets. Estimates suggest significant market concentration increases, resulting in between 10% (transport networks) and 24% (mobile networks) rises in equipment prices. This would result in an incremental cost of around €8.5 billion, based on anticipated investment between 2027 and 2030.

These direct costs will have secondary effects. Due to market structure and high levels of price competition among mobile operators, most of the cost increase will translate into scaled down and delayed network improvements. Higher costs will constrain operators' ability to expand coverage, upgrade capacity and deploy advanced technologies, ultimately slowing the pace of digital infrastructure development across the continent.

Additional capacity constraints stem from the sheer scale of resources needed to replace the infrastructure on the side of operators, and to scale up equipment output on the side of the remaining vendors. This introduces significant uncertainty and additional risks around network resilience, the cost of which cannot be reasonably quantified.

Broader economic effects on productivity and growth will likely be even higher

While this study focuses only on direct cost impacts, the effects will generate significant secondary impacts on broader economic performance. High-quality, affordable network infrastructure serves as a foundational, general-purpose technology that underpins productivity gains, innovation and economic growth. Slower or more expensive 5G/6G deployment will hinder the EU's ability to meet its ambitious Digital Decade 2030 targets.

The recent GSMA Intelligence study *Mobile investment needs in Europe*[13] highlights that the region already faces a substantial structural investment gap, with around €475 billion required to deliver best-in-class connectivity but only €270 billion currently expected to materialise – a shortfall of approximately €205 billion. This funding constraint sits alongside lower investment intensity and declining revenues per connection compared to global leaders, contributing to a widening performance gap in advanced network deployment, including 5G standalone.

In this context, additional cost burdens imposed on operators, such as those associated with the removal and replacement of HRV equipment, risk further constraining already limited investment capacity. By diverting capital away from network expansion and innovation, such measures are likely to exacerbate Europe's existing underinvestment challenge and make it more difficult for the region to close the gap with global digital leaders, undermining progress towards its broader digital and competitiveness objectives.

Economic literature is clear on the strong link between network quality and economic performance.

- A 10% increase in mobile broadband adoption is associated with approximately 0.8% higher GDP.[14]
- Doubling mobile data use can add 0.5 percentage points to GDP per capita growth.[15]

GSMA research further highlights that mobile technologies already contribute significantly to GDP (around 6.4% globally in recent years), with 5G expected to generate hundreds of billions of euros in additional value through productivity improvements in manufacturing, healthcare, logistics and smart cities.[16]

Hence, the wider indirect effects, stemming from missed opportunities for productivity growth, slower adoption of cutting-edge use cases (e.g. industrial automation, AI-enabled services and immersive applications), and reduced digital competitiveness could multiply the direct impacts many times over.

[13] Mobile investment needs in Europe, GSMA, 2026
[14] How important are mobile broadband networks for the global economic development? Edquist et al, 2018
[15] "GSMA and Deloitte Release Comprehensive Research into the Impact of Mobile Telephony on Economic Growth", GSMA, November 2012
[16] The Mobile Economy 2026, GSMA, 2026

Appendix: methodology

Extrapolation of the rip-and-replace cost

The GSMA Intelligence survey of EU operators covered seven operator groups and 28 individual country operations, accounting for:

- 258 million mobile connections (of 588 million in the EU)
- 77 million fixed connections (of 181 million in the EU).

The data collected included information on the total aggregate replacement cost estimated individually by each group.

Cost of replacement in mobile networks

To calculate the EU-wide total replacement cost of HRV equipment, we employ two different extrapolation methods to infer the replacement cost among non-surveyed operators.

Lower-bound approach

With this approach, we rely on the GSMA Intelligence Network Tracker database to set an HRV exposure flag for non-surveyed operators. The database provides information on mobile networks launched by operators (including launch date) as well as vendor information. We set an HRV flag if an operator launched a network using HRV equipment in the past 10 years – for these operators, we assume replacement cost per connection to be equal to that among surveyed operator groups.

- If an operator is flagged as having at least some HRV equipment, we assume the same cost per connection as the average among surveyed operator groups. This group accounted for 196 million connections.
- If an operator is flagged as having no HRV vendors listed (but having other vendors listed), we assume zero cost of replacement. This group accounted for 118 million connections.
- For operators with no mobile network vendor data, we assume the arithmetic average cost per connection of the two groups above (with data). This group accounted for 95 million connections.

Because network vendor information is missing for some networks, the approach is likely to under-identify HRV exposure. This approach is therefore likely to result in a lower-bound cost estimate.

Upper-bound approach

This assumes that all non-surveyed EU operators will face the same replacement cost per connection as surveyed operators. Non-surveyed operators will include some with no HRV exposure but may also include other operators that have more HRV exposure than nearly half the

market we gathered data for. We consider this scenario to be an upper-bound estimate of the total cost of replacement. Our network database suggests a more common presence of HRV equipment among surveyed operators (71% launched a network using HRV equipment in the past 10 years), compared to non-surveyed operators (51%). This does not reflect vendor market share, just the presence of HRVs in networks. Uncertainty therefore remains as to whether exposure is higher among surveyed operators.

Cost of replacement in fixed networks

Similarly to mobile networks, we take two approaches to extrapolate to non-surveyed operators:

Lower-bound approach

This relies on the same method of flagging converged operators (operating in fixed and mobile markets) based on the estimated HRV exposure in their mobile networks, thereby extrapolating from their exposure in mobile networks to exposure in fixed networks. However, because many fixed operators do not operate mobile networks, this resulted in partial matching only:

- We set an HRV flag for operators accounting for 33 million connections. For these operators, we assume the same replacement cost per fixed connection as the average among surveyed operators.
- We set a ‘no HRV exposure’ flag for operators accounting for 2.4 million fixed connections, and assume no replacement cost in their fixed operations.
- For fixed operators without matching mobile network vendor data (95 million connections), we assume the average cost per connection of the two groups above (with data).

Upper-bound approach

This assumes the same cost per connection among non-surveyed operators as the average among surveyed operators.

The number of fixed connections is based on GSMA Intelligence data. Because some fixed operators are not present in the GSMA Intelligence database, we scale the number of connections using ITU fixed subscriber penetration data, to ensure totals match.

Cost of replacement in transport networks

We apply the same lower-bound and upper-bound approaches as for mobile and fixed networks. As transport networks support both fixed and mobile networks, we extrapolate on the basis of the average replacement cost per combined fixed and mobile connections (from the survey of operators).

Impact on pricing due to reduced competition

We rely on the indicative price rise (IPR) approach.[17] The allows for the calculation of the profit-maximising increase in prices by the remaining players in response to the exit of competitors – in this case, the exit of HRVs from the EU network equipment market.

Under this characterisation of competition, the remaining operators are able to capture HRVs' market share (diversion). Because diversion paths from HRVs to specific remaining vendors are not well established, we assume that sales will be diverted to remaining players in proportion to their existing market share. For example, if the current market share of HRVs is 40%, we assume each of the remaining players' market shares will scale up by 40%/(1–40%). This assumption provides a good approximation of expected behaviour, as the remaining market players are expected to scale up production by the same factor, meaning the largest remaining player is expected to capture the largest portion of HRV sales, while the smallest players will capture the smallest portions of the void left by the exit of HRVs (scaling sales by a uniform factor).

For simplicity, we assume that the exit of HRVs takes place as a single event (the simultaneous exit of all HRVs), rather than sequentially.

To perform calculations, we rely on the assumed current market shares in each network area (mobile, fixed, transport). Current shares of the EU market are a GSMA Intelligence assessment based on market intelligence. We group the smallest market players into an 'other' category and treat them as a single entity in the calculation of IPR. Given the relatively high levels of market concentration among the biggest players, this treatment has only a minor impact on the reliability of the estimated IPR.

[17] Mergers with Differentiated Products, Shapiro, 2014

Figure 7: Current and projected shares of vendors in the EU mobile network equipment market

Source: GSMA Intelligence assumptions

Mobile	Current	After HRV exclusion
Huawei	25.0%	0.0%
ZTE	7.0%	0.0%
Ericsson	40.0%	58.8%
Nokia	25.0%	36.8%
Samsung	1.0%	1.5%
Other	1.0%	1.5%
Fixed	**Current**	**After HRV exclusion**
Huawei	27.5%	0.0%
ZTE	7.5%	0.0%
FiberHome	4.5%	0.0%
Ericsson	5.0%	8.3%
Nokia	30.0%	49.6%
Cisco	4.0%	6.6%
Adtran	6.5%	10.7%
Calix	4.5%	7.4%
Other	10.5%	17.4%
Transport	**Current**	**After HRV exclusion**
Huawei	20.0%	0.0%
ZTE	7.5%	0.0%
Ericsson	4.0%	5.5%
Nokia	22.5%	31.0%
Cisco	12.5%	17.2%
Ciena	17.5%	24.1%
Adva/Adtran	4.5%	6.2%
Fujitsu	3.5%	4.8%
Other	8.0%	11.0%

In line with the IPR formula, we additionally rely on gross profit margins of different market players in the mobile, fixed and transport markets. Because no information was available on profit margins specific to a particular area of activity of each firm in the EU, we make simplified assumptions based on global financial statements of the relevant firms, which typically concern all a company's activities and products.

Figure 8: Assumed current profit margins

Source: GSMA Intelligence assumptions

Mobile	Margin
HRVs	**46%**
Ericsson	50%
Nokia	48%
Samsung	48%
Other	48%
Fixed	**Margin**
HRVs	**46%**
Ericsson	50%
Nokia	48%
Cisco	45%
Adva/Adtran	33%
Calix	39%
Other	44%
Transport	**Margin**
HRVs	**46%**
Ericsson	50%
Nokia	48%
Cisco	45%
Ciena	44%
Adva/Adtran	33%
Fujitsu	44%
Other	44%

The cumulative monetary cost impact is obtained by multiplying percentage increases in prices by projected baseline investment in the physical equipment subject to CSA2 regulations in the network area.

We conduct this in three steps. First, operator survey data is used to calculate the average capex per connection in each network area (mobile, fixed, transport). We then project the overall total investment in each network area:

- For mobile, we rely directly on GSMA Intelligence forecasts of investment in mobile.
- For fixed, we calculate reference year (2025) total EU investment by multiplying the average surveyed fixed capex per connection by the number of connections. We then project this total forward by indexing to the projected change in the number of fixed connections (based on GSMA Intelligence fixed penetration forecast) and index to follow the same trend as the mobile investment per connection (based on GSMA Intelligence forecasts of mobile capex and mobile connections).
- For transport, we calculate reference year (2025) total EU investment by multiplying the average surveyed capex in transport infrastructure per connection (combined mobile and fixed connections). We then project this total forward by indexing to the projected change in the number of total mobile and fixed connections (based on GSMA Intelligence forecasts)

and index to follow the same trend as the mobile investment per connection (based on GSMA Intelligence forecast of mobile capex and mobile connections).

In the last step, we multiply the projected capex in each area by the share of equipment subject to CSA2 restrictions (see Figure 9, based on GSMA Intelligence assessment and operator validation). This allows us to specifically identify the projected investment in equipment subject to restrictions, and exclude other investment expenses, such as labour and passive elements).

Figure 9: Physical active equipment subject to CSA2 regulations, as a share of total capex

Source: GSMA Intelligence assumptions

Network area	Share
Mobile	40%
Fixed	40%
Transport	50%

It is important to note that the estimated rip-and-replace costs and estimated cost impacts on future investment are not additive and are considered in isolation. In practice, these could interact. For example, the price effect could drive up the cost of rip and replace. At the same time, replacement of equipment to comply with regulations could change the future trajectory of investment, affecting the future impact of elevated pricing on operators' investment.

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