Berg Insight™

Pelion

Analyst report

How connectivity serves as the backbone for e-bikes and micromobility fleets

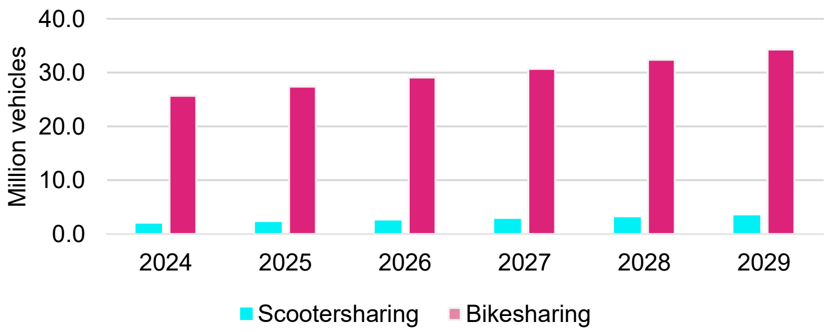
January 2026

Micromobility is becoming a mature market

Urban travel is becoming increasingly multimodal as people switch between private cars, public transport and new micromobility options. Short trips that once relied on private cars are shifting to e-bikes, scooters and other lightweight vehicles. The e-bike and micromobility ecosystems include several vehicle types that are either privately owned or deployed as part of shared micromobility schemes.

In the early years of micromobility, fleets grew at a rapid pace, fueled by investor funding and a race for market share. Many operators prioritized scale over profitability, which led to operational inefficiencies and in some cases business failures. The market has since matured, with operators now increasingly focused on operational efficiency, unit economics and profitability, while cities have strengthened their regulatory oversight. This shift towards maturity has elevated the role of technology, and in particular connectivity, from a supporting function to a strategic enabler.

Figure 1: Shared micromobility fleet by service (World 2024–2029)

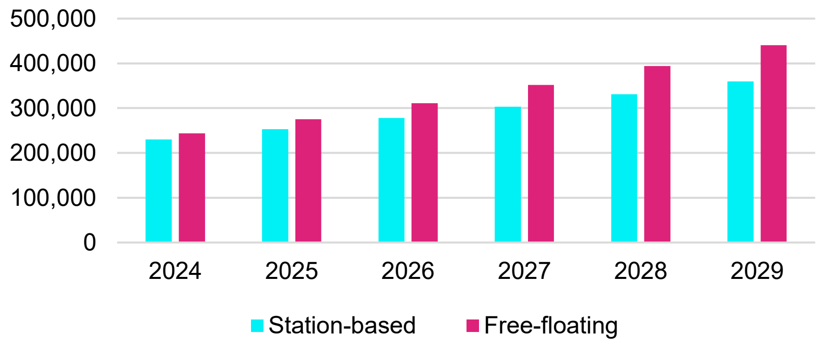


Cities tighten control as scooters and bikes become core shared micromobility modes

The two dominant forms of shared micromobility vehicles are stand-up scooters and bicycles, including both conventional and electric models. Services are offered by specialist micromobility companies, local authorities and public transport operators. Leading operators have deployed hundreds of thousands of vehicles across major cities.

The relationship between cities and micromobility operators has evolved significantly. Early deployments were often characterized by limited coordination with cities. Today, most cities require formal permits, impose fleet caps and define operational requirements through tenders and regulatory frameworks. Cities increasingly control where, how and by whom micromobility services are operated, and data-driven reporting is often a prerequisite for maintaining operating rights.

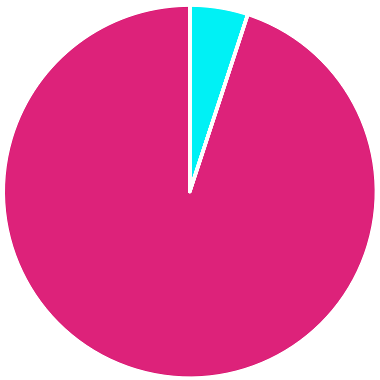
Figure 2: Bikesharing vehicles by service type (Europe 2024–2029)



Stand-up scooters dominate the scootersharing market

Stand-up scooters account for a large portion of vehicles deployed in scootersharing schemes. Europe is home to several leading operators such as Dott, Bolt and Voi. Market growth is closely tied to cities' willingness to allow scootersharing services. Many cities have put restrictions on the number of scooters in the cities and on which operators are allowed to run the services. In some cases, cities have chosen to ban scootersharing altogether. Connectivity plays a critical role in enabling operators to comply with city requirements, through functions such as geofencing, speed limitation zones, parking enforcement and real-time vehicle monitoring.

Figure 3: Scootersharing service by vehicle type (Europe 2024)



Why connectivity is key for operating efficient micromobility schemes

Embedded connectivity is the backbone of shared micromobility services. Vehicles must be equipped with a telematics device connected to cloud-based platforms to power functions such as user authentication, trip recording, fleet management and billing. This connectivity layer also enables remote control and policy enforcement, including lock and unlock commands, alarm triggers and configuration changes that can be pushed without physically accessing the vehicle.

Micromobility software platforms integrate vehicle connectivity with booking systems, payment processing and operational dashboards. Data generated by connected vehicles is used to optimize fleet distribution, schedule maintenance and improve service quality. Typical inputs include location, battery level, ride frequency, fault codes and lock events, which together support better demand forecasting, smarter rebalancing and more efficient field operations.

As profitability has become a central priority, operators increasingly rely on connectivity-enabled analytics to maximize rides per vehicle and reduce operational costs. Real-time data allows operators to identify underutilized assets, rebalance fleets efficiently and proactively address technical issues, thereby improving both fleet utilization and customer satisfaction.

Connectivity also supports compliance in regulated cities through geofencing, parking controls and auditable reporting. Over time, operators that build tight feedback loops between connected vehicle data and day-to-day operations are better positioned to improve unit economics and win or retain operating rights

London

60,000 | 15,000 | 4,000

The micromobility market in London is characterized by a strong e-bike presence. The city has more than 60,000 e-bikes across free-floating and station-based schemes, including about 45,000 from Lime and 15,000 from Forest, with no city-wide cap. Shared e-scooters are strictly controlled, with each operator limited to 2,000 vehicles. The bikesharing ecosystem is dominated by large operators and growth relies on operator scale rather than e-bike limits, in contrast to the tightly capped e-scooter sector.

Paris

18,000 | 20,000 | 0

Paris applies different rules for shared micromobility. Since 2023, stand-up scooters have been forbidden following a public vote. In June 2025, the city awarded new four-year contracts to Voi, Dott and Lime for bikesharing vehicles. Each company is allowed to deploy 6,000 bicycles. Station-based bikesharing is available via Vélib, one of the largest schemes in Europe, which offered 20,000 bikes at 1,500 stations across Paris and 65 neighboring municipalities at the end of 2024.

Washington D.C.

5,000 | 8,000 | 8,000

Washington DC has a growing shared micromobility market with public and private bikesharing services. Capital Bikeshare operates over 8,000 bikes at 800 docking stations and exceeded 6 million trips in 2024. Private operators include Lime, Hopp and Veo, which together recorded 8.6 million free-floating trips, with 2025 ridership up 43 percent year-on-year. Three scootersharing services are available: Hopp, Veo and Lime.

Milano

13,000 | 5,000 | 6,000

Milan's micromobility landscape combines station-based and free-floating systems, with strict regulatory caps ensuring controlled growth. The station-based BikeMi service (operated by Clear Channel) has a fleet of around 5,000, while free-floating e-bikes from operators like Dott, Lime and RideMovi can scale to 15,000 vehicles total (5,000 per operator). Shared e-scooters are capped at 6,000 vehicles citywide and distributed among licensed operators.

Chicago

0 | 17,000 | 6,000

Chicago has an expanding shared micromobility market that includes both free-floating and station-based systems. The two major operators in the city are Divvy Bikes and Lime. The two companies together recorded 12 million shared micromobility trips in 2025 in Chicago. This number has grown from 11 million in 2024 from 8.7 million in 2023. Shared e-scooters are also available under city permits that cap fleet sizes.

Berlin

15,000 | 5,000 | 19,000

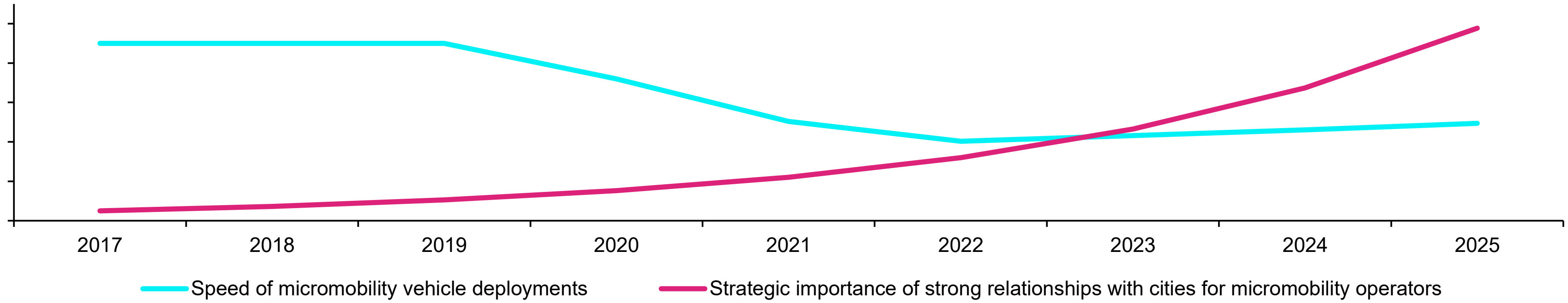
Berlin has reduced the permitted scootersharing fleet to around 19,000 scooters to improve safety and manage street space. The main e-scooter operators in Berlin are Lime, Bolt, Dott and Voi. Deutsche Bahn's Call a Bike operates around 5,000 station-based bicycles, while free-floating e-bikes from operators such as Dott, Lime, Voi and Bolt add around 15,000 vehicles across the city.

Close collaboration between cities and micromobility operators

The relationship between cities and shared mobility operators has changed drastically since the inception of micromobility services. In the first years, mobility operators had limited relationships with cities. The regulatory landscape has today caught up, as shared mobility operators generally need to gain permission to deploy vehicles and cities have more power in the negotiations. Many cities use tenders to award operators the right to operate micromobility services in the cities. The demands from the cities on the shared mobility operations are furthermore increasing. An example is that cities often require a certain vehicle utilization rate of the vehicles deployed. Some operators argue that cities tend to impose overly restrictive regulations.

Cities increasingly view micromobility services as a critical part of the transportation system. Partnerships can be formed between the cities and the micromobility operators. For example, the micromobility services can be subsidized by the city, especially in underserved neighborhoods. Some cities apply revenue-sharing models where the city gets part of the micromobility service revenue. However, this approach has been criticized by leading micromobility operators as it can lead to trade-offs in service quality, safety and affordability when cities select operators with the greatest financial return in tenders. The battle between micromobility operators and the cities is expected to continue over the coming years. The power advantage will likely swing between the parties until an equilibrium is reached.

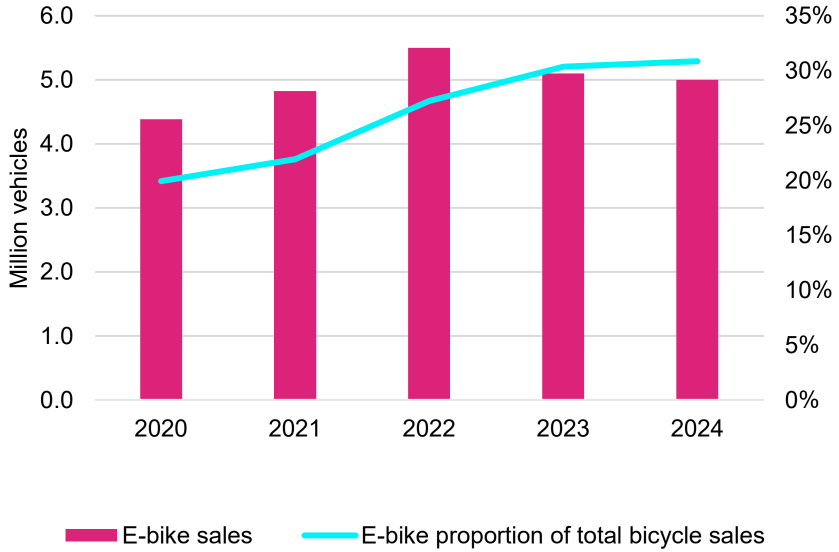
Figure 4: Vehicle deployment speed vs the importance of city relationships



The number of privately used e-bikes continues to grow

While e-bikes are widely used in shared micromobility schemes, there are also a considerable number of privately used e-bikes. The e-bike market is served by a large number of bicycle OEMs in a fragmented market. Around 5 million electric bicycles are sold annually in Europe, accounting for more than 30 percent of all bicycles sold. During the pandemic, bicycle sales surged as people changed their transportation habits. This created some overcapacity, which was still noticeable in the market in 2023 and 2024. However, this is expected to have largely been resolved, and sales of electric bicycles are projected to grow in the coming years.

Figure 5: E-bike market data (Europe 2020–2024)



How connectivity solves one of the biggest pain points for e-bike riders

As e-bikes increasingly become high-value consumer products, connectivity-enabled services are emerging as an important differentiator for OEMs seeking to strengthen their market position. Bicycles are much more likely to be stolen than cars, motorcycles and mopeds due to factors such as low weight and availability. Electric bicycles are especially targeted by thieves as they are often significantly more valuable than conventional bikes.

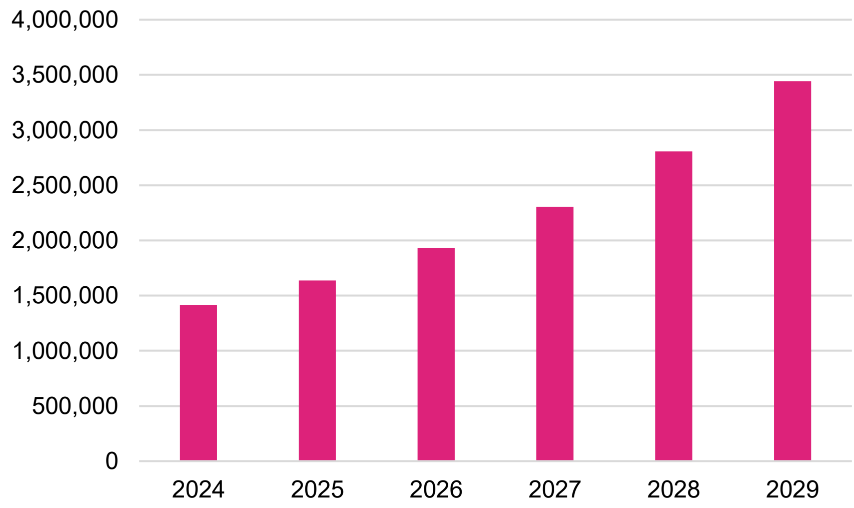
Concerns about theft have become one of the most important factors influencing consumer purchasing decisions for e-bikes. As a result, many bicycle OEMs have adopted stolen vehicle tracking (SVT) solutions based on embedded cellular connectivity in recent years. In some markets, insurers require approved tracking solutions for coverage or offer reduced premiums for connected e-bikes, which further reinforces the value of embedded connectivity.

The e-bike is becoming a software-defined product

Beyond theft prevention, connectivity enhances the overall ownership experience for e-bike riders. Access to real-time bike location, battery status and usage data provides peace of mind and improves usability. Connectivity also enables remote locking, movement alerts and integration with smartphone applications. For OEMs, embedded connectivity enables over-the-air software updates, allowing new features, performance improvements or security patches to be deployed throughout the lifecycle of the bike. These capabilities transform the e-bike from a static product into a continuously improving digital platform, which strengthens customer engagement and brand loyalty.

Concerns about theft have become one of the most important factors influencing consumer purchasing decisions for e-bikes

Figure 6: Installed base of embedded bicycle telematics systems (Europe 2024–2029)



Bicycle OEMs leverage new technologies to transform customer relationships

Although direct-to-consumer sales are becoming more common, most bicycles are still sold through dealer networks. Historically, this has limited direct interaction between OEMs and end customers.

In the cases where customers have bought bicycles directly from the OEMs, the relationship has traditionally been of a transactional nature, characterized by one-time purchases. Connectivity changes this dynamic by enabling ongoing engagement throughout the product lifecycle.

Connected e-bikes allow OEMs to collect anonymized usage data that can be used to improve diagnostics, enable predictive maintenance and inform future product development. Smartphone applications act as the primary interface between riders and OEMs, creating new digital touchpoints beyond the initial sale.

Connectivity also enables new commercial models, such as subscription-based services for theft recovery, extended warranties or premium features. Over time, this supports a shift from transactional sales to longer-term customer relationships.

Figure 7: Overview of the bicycle OEM and rider relationship

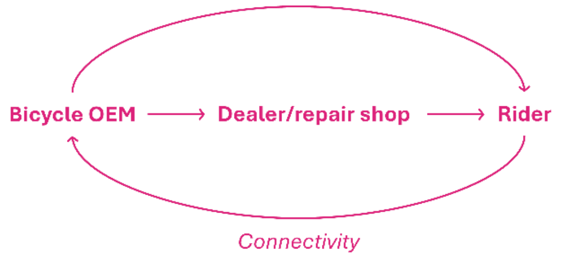
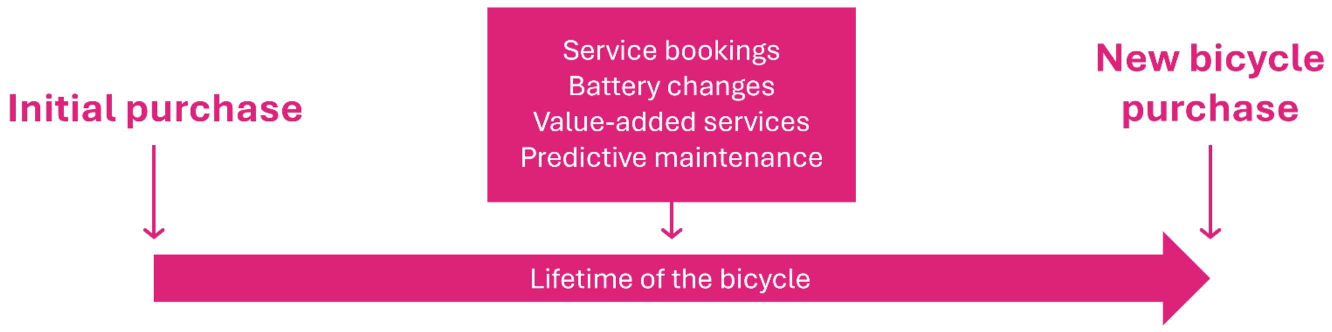


Figure 8: Opportunities for bicycle OEMs



Key connectivity security principles for e-bike OEMs and micromobility operators

Core security concepts from the wider connectivity industry apply directly to e-bikes and shared micromobility fleets. These vehicles are mobile, frequently deployed in public spaces and generate sensitive location and behavioral data. Trust in connected mobility therefore relies on strong connectivity security controls and disciplined data governance, with leading platforms treating privacy, protection and user control as baseline requirements rather than optional features.

These domains highlight the areas where operators and OEMs must focus to ensure robust security across devices, networks and platforms:

- **Data in transit:** Ensure end-to-end encryption, use private APNs and VPN tunnelling to prevent interception or tampering during vehicle-to-cloud communication.
- **Data at rest:** Encrypt stored data and enforce access control on backend platforms and dashboards to protect sensitive telematics and user information.
- **Device identity and authorization:** Implement unique device identifiers, secure boot, and mutual authentication to ensure only authorized e-bikes or scooters connect to the network.
- **SIM security:** Leverage eSIM/eUICC capabilities, SIM locking and profile management to mitigate SIM fraud and enable secure over-the-air provisioning.
- **Platform and API access control:** Use token-based access, rate limiting, audit logs, and role-based permissions to secure integrations with fleet management and analytics systems.
- **Ongoing security discipline:** Regularly maintain up-to-date credentials, incident response procedures, audit trails, compliance reporting and continuously improve security measures to address evolving threats.

OEMs and micromobility operators seek flexible connectivity solutions

Micromobility operators and bicycle OEMs operate in highly competitive markets with pressure on margins. As the strive for profitability continues, operators continue to seek opportunities to save costs while ensuring the same quality and reliability. Connectivity is one lever where better choices can reduce the total cost of ownership.

For operators, connectivity must be reliable and flexible across multiple countries, while remaining cost-efficient at scale. Mobility providers should prioritize partners that support multi-network connectivity, remote SIM provisioning and centralized management from an early stage.

Fleet refresh cycles create natural procurement windows and switching connectivity providers is often triggered when new vehicles are produced alongside unresolved incumbent issues. The buying process is often led by operations stakeholders, with input from leaders focused on business continuity and risk, fleet performance and engineering compatibility and rollout practicality.

For OEMs, the cost of connectivity must be low enough to either be absorbed into the product price or offered to consumers at an acceptable subscription level. How consumers will respond to the introduction of subscription services at the point of purchase remains unclear. If the automotive OEM market is any precedent, willingness to pay for connected services has been lukewarm. The outcome might differ in the bicycle OEM market, where many users have a strong attachment to their bikes and value them highly, but it may still be crucial for bicycle OEMs to introduce cheaper connected services at first to ensure riders actually try them.

> "As shared micromobility continues to mature – as the market consolidates and operators professionalize, IoT connectivity will be the defining competitive advantage – enabling smarter fleets, with better operating economics that will deliver sustainable long-term growth."
>
> – Dave Weidner, CEO, Pelion

Implications for mobility providers looking for connectivity providers

Choosing the right connectivity solution is critical for micromobility operators and e-bike OEMs. Many deployments span multiple countries and cities, introducing complexity around local regulations, roaming constraints and SIM provisioning workflows between markets. Operators need a partner that can provide consistent coverage across regions, transparent service performance and a single operational model for onboarding, monitoring and lifecycle management across the footprint.

Multi-network connectivity is particularly valuable in micromobility because fleets operate in dense urban environments where coverage can vary block by block, while reliability expectations are high and failures are immediately visible to riders and city authorities. In practical terms, multi-network connectivity means a vehicle can connect to more than one mobile network, typically through roaming-based multi-operator access.

The key benefit of multi-network connectivity is resilience. If a preferred network is congested, unavailable, or performs poorly in a specific area, the device can attach to an alternative network and remain operational. This reduces ride start failures, improves the reliability of lock and unlock commands and keeps telemetry flowing for rebalancing, maintenance and incident response. Proofs-of-concepts (PoCs) with explicit acceptance measures are often used to validate performance in the operator's own footprint.

Partners that combine multi-network reach with strong operational tooling help operators deliver a uniform service level, while maintaining the flexibility to adapt connectivity profiles, policies and commercial terms as deployments evolve.

Conclusions and strategic recommendations

Micromobility has entered a more mature phase and has shifted from rapid fleet expansion to a sharper focus on utilization, service reliability and unit economics. Cities are tightening control as e-scooters and bikes become core modes in shared mobility, making compliance features such as geo-fencing, parking controls and auditable reporting increasingly important. At the same time, privately owned e-bikes continue to gain traction, with embedded connectivity moving beyond theft recovery towards broader lifecycle services and a more software-defined product experience.

Against this backdrop, the conclusions and recommendations below highlight how micromobility operators and e-bike OEMs can reduce risk, improve total cost of ownership and build a connectivity foundation that scales across cities and product generations.

- Connectivity increasingly functions as part of the operational foundation for micromobility operators. KPIs should link directly to rider experience and cost, including ride starts, lock and unlock reliability, telemetry continuity and support ticket volumes.

- Resilience is best expressed as clear and measurable expectations. This typically includes named-network performance in priority zones, fallback behavior, stability targets and minimum coverage for testing, alongside platform fit such as APIs, diagnostics and integration with operational workflows.

- Proof-of-concepts have become a practical way to reduce risk early. Testing in real operating conditions should be conducted before longer-term commitments are made, particularly in dense urban environments where network coverage can vary block by block.

- Buying decisions are usually formed by a cross-functional stakeholder group. Operations leaders focus on continuity and risk, fleet teams on day-to-day reliability, engineering on compatibility and rollout practicality and procurement on transparent pricing and workable SLAs.

- Multi-country deployments benefit from planning for scale and change from the outset. Remote SIM provisioning, centralized connectivity management, and bulk activation and suspension reduce friction over time.

- Connectivity security must be treated as a baseline requirement for e-bike OEMs and shared micromobility operators. Device and SIM security, encryption, authentication and controlled platform access should be paired with disciplined data governance, ongoing security maintenance and privacy safeguards.

Appendix: IoT Connectivity Evaluation Framework for e-bike OEMs and micromobility operators

1. Understand Business Needs & Use Cases
   - Define core objectives (tracking, monitoring, automation, etc.)
   - Identify device types, expected volumes, and geographies
   - Map requirements to business outcomes

2. Short-Term vs. Long-Term Deployment
   - Short-term: speed of rollout, ease of integration
   - Long-term: scalability, global coverage, contract flexibility

3. Connectivity Technology Landscape
   - Assess available technologies (2G/3G sunset, LTE-M, NB-IoT, 4G, 5G)
   - Match technology to device lifecycle and data requirements

4. Connectivity Provider Selection Criteria
   - Network coverage and quality
   - SIM/eSIM capabilities
   - Management platform and APIs

5. Vendor Stability & References
   - Choose partners positioned for long-term viability
   - Verify customer references and case studies
   - Review financial health and market presence

6. Build a Procurement Strategy
   - Align internal stakeholders (IT, procurement, operations)
   - Define selection timelines and evaluation criteria
   - Balance technical needs with commercial priorities

7. Evaluate Vendors: Test, Pilot, Compare
   - Run proof-of-concept deployments
   - Assess ease of integration and support responsiveness
   - Compare performance across regions

8. Use a Scoring Matrix
   - Create weighted criteria (coverage, cost, platform features, SLAs)
   - Use scores to drive objective decision-making

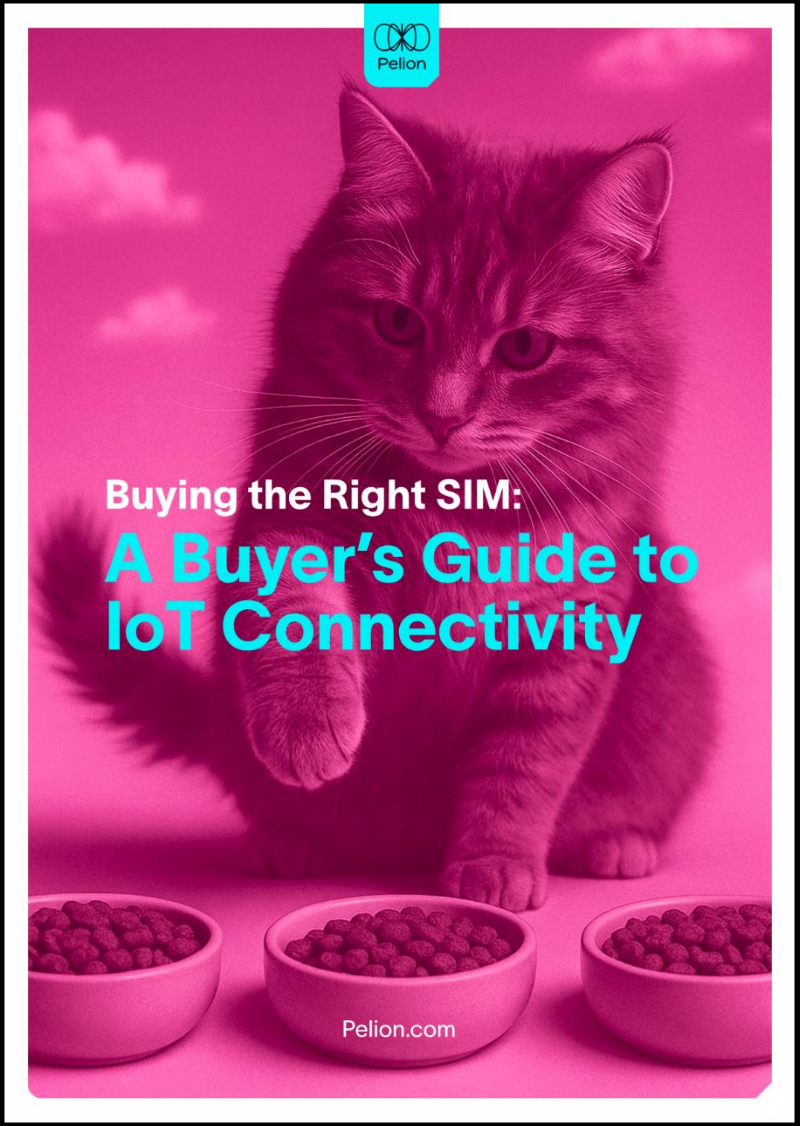
9. Cost Models & Flexibility
   - Review pricing options (per SIM, per MB, bundled plans)
   - Look for flexibility as volumes and geographies change
   - Check for hidden fees (roaming, activation, termination)

10. Security, Compliance & Risk Management
    - Ensure compliance with local regulations (GDPR, HIPAA, etc.)
    - Review encryption, authentication, and data isolation practices
    - Assess vendor's incident response processes

11. Managing Scale
    - SIM lifecycle management (activation, suspension, replacement)
    - Roaming agreements for cross-border deployments
    - Global reach through multi-network or aggregator models

12. Procurement Process Flow
    - Draft RFP with clear requirements
    - Shortlist and evaluate vendors against scoring matrix
    - Negotiate contract terms and SLAs
    - Finalize vendor and initiate rollout

Access Pelion's full buyer's guide to IoT connectivity here



Pelion offers a comprehensive cellular IoT connectivity solution designed to meet rigorous IoT connectivity requirements. Our global multi-network SIMs include eUICC-enabled eSIM profiles for seamless carrier switching, ensuring robust coverage and resilience.

Pelion's connectivity management platform, the Pelion Portal, features an intuitive self-service portal, extensive APIs, and integrations with leading cloud providers. The solution prioritizes security through end-to-end encryption, and compliance support.

With scalable pricing, unified billing, and strong SLAs delivering industry-leading uptime of 99.995%, it doesn't matter whether you're deploying 10 devices or 100,000 across continents – Pelion enables secure, resilient, and scalable cellular IoT connectivity.

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