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Transformation

Physical AI, part 3: The future of mobility

26 March 2026

Key takeaways

- Physical AI is transforming mobility, shifting vehicles from software-defined machines to AI-defined platforms with reusable intelligence that spans autos, trucks, drones and industrial equipment. This marks a structural transition where anything that moves is becoming autonomous.
- Robotaxis, autonomous trucks and drone networks are accelerating toward commercialization, supported by falling hardware costs, maturing regulation and scalable software infrastructure. These advancements are reshaping value chains, enabling new business models and expanding multi-billion-dollar addressable markets.
- In this third and final part of our physical AI series, we spotlight key trends that are gaining rapid commercial momentum and redefining the future of mobility.

Physical AI and the future of mobility

Today, physical AI is reshaping mobility, from AI-defined vehicles to highly automated robotaxis and fully autonomous fleets. Those same capabilities are rapidly spreading to trucks, delivery robots and a growing class of machines, signaling a structural shift: anything that moves is going autonomous.

Vehicles represent one of the first scaled deployment environments for physical AI – where perception, world modeling, planning and safety-critical execution converge. While fully autonomous vehicle (AV) technologies are beginning to scale, higher volume deployments of physical AI in mobility in the near term are driver assistance technologies and reusable software infrastructure. In turn, this enhanced software, when paired with increasingly capable high-powered compute, is the key enabler for higher levels of autonomy.

Future car: From software-defined to AI-defined

The auto industry is moving beyond software-defined vehicles toward AI-defined platforms, where *intelligence* rather than code shapes functionality and differentiation. Why? It enables continuously intelligent, data-driven automotive platforms. This adaptability is becoming core to the driving experience because it can be changed and upgraded over time – and not limited to when the car is manufactured. But the trickle-down effect is real: this shift is rapidly impacting vehicle manufacturers, suppliers and technology providers through hardware and software needs required to enable this shift.

The implication? Vehicles are becoming part of a broader physical AI ecosystem linking production, energy and operations into a continuous automated loop.

Start with software, end in autonomy

Autos offer something no other industry can match at scale: huge production volumes, strict safety requirements and complex operating environments. All of this makes cars the ideal place to mature and industrialize embodied intelligence long before full autonomy becomes mainstream.

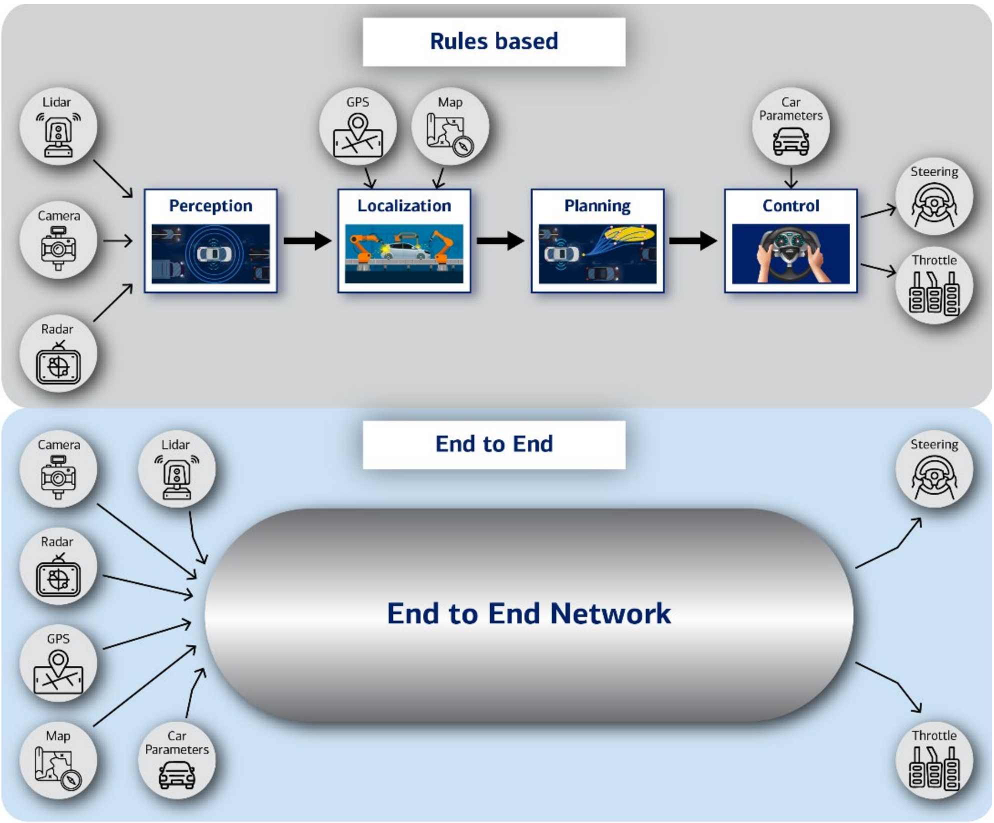
Vehicle intelligence is no longer just an "autonomous driving feature" – it's evolving into a core layer of *physical AI infrastructure* built directly into the vehicle. This intelligence now includes engineering tools, safety-critical operating systems and in-vehicle AI software – not just driving policy. Once developed, these capabilities can be reused across different models, brands and even entirely different types of machines. This shift mirrors the broader physical AI landscape, where companies are racing to create intelligence that can be certified, scaled and transferred across domains.

But physical AI isn't just software magic – it's constrained by real-world engineering and hardware realities. Early choices in sensors, compute and wiring set the ceiling for future autonomy and define how much intelligence you can run on the hardware the vehicle ships with. Most cars can add new features over time, but they can't be retrofitted for higher autonomy levels if they lack sensors, compute or fail-safes.

Unlocking a shared platform

As mentioned in Physical AI, part 1: The basics, end-to-end AI could enable a shared intelligence platform across both robots and AVs, since the same approach can train systems to manipulate objects or navigate roads (Exhibit 1). This unification promises faster rollout, lower costs and more scalable deployment than traditional modular methods, according to BofA Global Research. However, it also introduces trade-offs – requiring far more data and compute and creating tougher safety-validation challenges because errors are harder to trace – prompting companies to add extra models or software layers to compensate.

Exhibit 1: AV deployments could accelerate if the tech generalizes to new markets with embodied intelligence
Infographic depicting the shift from rules-based to end-to-end AI single-neural network



Source: BofA Global Research

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New revenue, new markets

Software-defined vehicles unlock new revenue streams: ongoing feature upgrades, services and fleet-level optimizations delivered over the air. A central compute "brain" orchestrates these capabilities. And the benefits don't stop with passenger cars. According to Applied Intuition, roughly 90% of what's needed for safety-critical physical AI applies across trucks, industrial machines, mining equipment and defense systems. Autos effectively *fund* the ecosystem for physical AI everywhere else.

Why do we need autonomous vehicles?

Beyond the economic rationale, road safety and a range of demographic challenges underpin the need for AVs:

- **Safety**: Around 94% of road accidents stem from human error, making safety a structural limit of manual driving.[1]
- **Structural labor shortage**: A global driver shortage is emerging as workforces age and fewer people enter the profession. The global shortfall of roughly four million truck drivers is expected to double by 2028. And in Europe, for instance, the average truck driver is 47 and the average bus driver is 50 – both older than the average working age of 43.
- **Regulatory constraints**: Hours-of-service rules cap driving time, reducing effective capacity even where drivers are available. The European Union (EU) and United Kingdom (UK) limit total driving at nine hours a day with the possibility to extend to 10 hours a day twice a week, with a maximum of 90 hours permitted over two consecutive weeks. Regulators in

[1] Occupational Road Safety Alliance. (n.d.). *Reducing Driver Error Accidents.*

Japan capped working hours and overtime in 2024 equivalent to ~6% of driver hours, exacerbating the already limited driver supply.

- **Rising transport costs**: Higher wages, fuel, tolls, insurance and compliance costs are pushing freight costs structurally higher.
- **Supply and demand imbalance**: Freight demand continues to grow (notably e-commerce), while capacity is constrained by labor and regulation.
- **Low asset utilization**: Roughly 20-30% of long-haul miles are run empty, highlighting inefficiencies AV fleets can address.
- **System resilience**: AVs reduce sole dependence on human availability, improving reliability amid labor volatility and disruptions.

Rise of the robotaxis

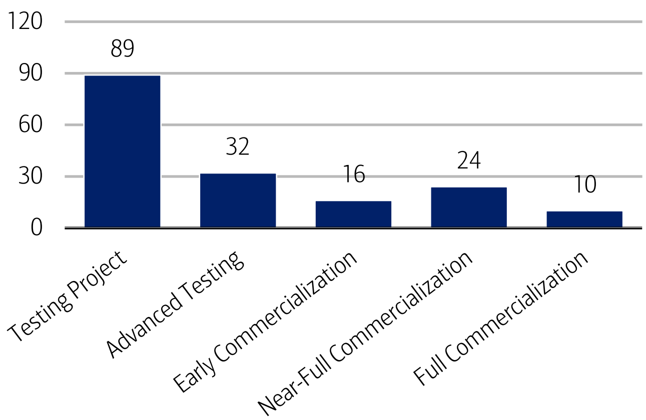
Robotaxi commercialization is quickly becoming a reality, with more than 170 active robotaxi deployments globally (Exhibit 2) – 40% in US and 24% in China (Exhibit 3). There are now 10 cities with fully commercial operations, including Atlanta, Austin, Los Angeles, Miami, Phoenix and San Francisco, in the US. These operations are defined as operating on public roads, accepting passengers, charging a fee, fully driverless without a safety driver and able to operate all day in any weather. Many more will likely follow, with 24 nearing commercialization (meeting four of these five criteria), and 16 at an early commercial stage (three of the criteria).

However, scaling is a challenge. Vehicles with sufficient sensors and capabilities remain expensive. Regulation is fragmented. Edge cases – the very rare and hard-to-predict road incidents – remain an engineering challenge to solve for and develop a sufficient safety case. But with the recent breakthroughs in AI and compute, the AV industry has a better opportunity to break through these bottlenecks and accelerate the rollout, evident from the first commercial operations beginning to expand.

But why now? Various hardware costs have fallen by more than 50% compared to previous AV models. And removing the driver could halve the cost per mile, unlocking more addressable markets. For more on how robotaxis work and the underlying technology stack, refer to The road ahead: The future of autonomous vehicles.

Exhibit 2: There are 171 active robotaxi deployments, 10 of which are fully commercial, with 40 more in early or near-full commercialization

Number of active robotaxi deployments and stage of commercialization



Source: BloombergNEF as of March 4, 2026, BofA Global Research

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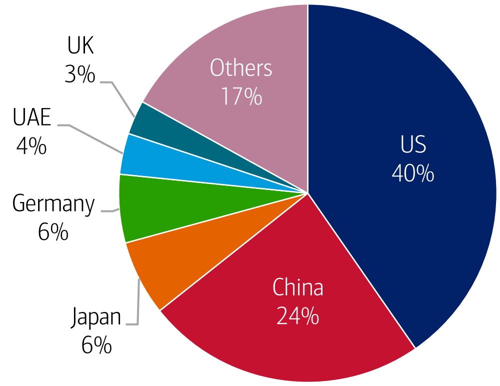
Exhibit 3: The US has the most active robotaxi and shuttle deployments to date (69, or 40% of the total)

Robotaxi and shuttle deployments globally (%)



Source: BloombergNEF as of March 4, 2026, BofA Global Research

Note: UAE = United Arab Emirates, UK = United Kingdom

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Ride-hail platforms racing to announce AV partnerships

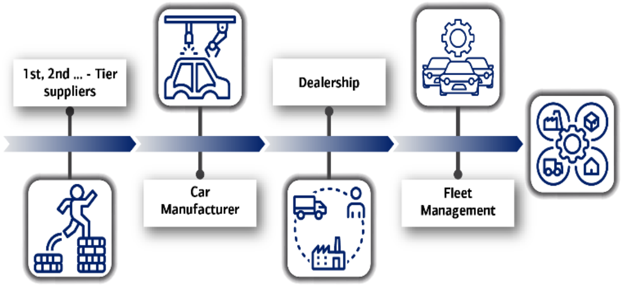
Global ride-hail platform leaders are increasingly partnering with, or investing in, AV developers to secure future access to driverless fleets, rather than build the technology themselves. Strategically, per BofA Global Research, AVs offer ride-hail operators greater control over service reliability and pricing, reduced dependency on human drivers and a long-term path to margin expansion, while allowing AV companies to scale faster by tapping into established global demand networks.

AV tech could blur the lines between private and shared vehicles

Multiple autonomous operating models are emerging in parallel – from privately owned AVs to shared robo-shuttles and ride-hailing robotaxis – and their boundaries may eventually blur. Today's mobility ecosystem is anchored in a traditional auto value chain centered on manufacturing, selling and maintaining vehicles (Exhibit 4). As AVs become commercially viable and lower the cost per mile, they could catalyze a shift away from personal car ownership toward on-demand mobility services. In this model, privately owned AVs might serve personal travel while also joining shared fleets when idle, and new tech-enabled platforms would make it easy for customers to choose the right mode for each trip. As a result, fleet management and multimodal aggregation could become increasingly central and lucrative within the future mobility value chain (Exhibit 5).

Exhibit 4: The current auto value chain is centered on manufacturing, selling and maintaining vehicles

Infographic illustrating current auto value chain



Source: BofA Global Research

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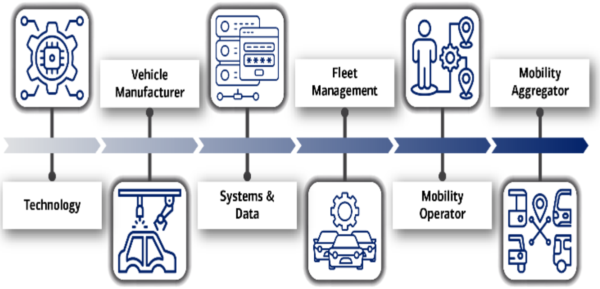
Exhibit 5: The commercial readiness of AVs could revolutionize the value chain, with fleet management and aggregation of other transportation services playing a more lucrative role

Infographic illustrating the potential value chain for (auto) mobility



Source: BofA Global Research

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Expanding AV business models, a $740 billion addressable market

As AV technology scales, developers are increasingly pursuing hybrid business models, combining fleet ownership, software licensing and partnerships rather than a single go-to-market approach. Reflecting this flexibility, AV software and systems could represent a $740 billion addressable market across consumer and commercial vehicles, according to Wayve.

Keep on (autonomously) trucking

Autonomous freight networks (AFNs) aim to disrupt the $4 trillion freight trucking market, creating a structure that can save significant operational costs by removing drivers from the cab, with enhanced fuel efficiency and routing compared to traditional truck operating models. The core technology is similar to that being added to passenger cars – a combination of sensors and software – albeit with different design, integration and operational design domain (ODD). For example, most AV car projects thus far focus on urban driving, whereas AV truck projects focus on highways and longer distances. This overlap is accelerating the emergence of physical AI, where core perception, planning and control infrastructure can be shared across autonomous platforms while being tuned for specific use cases.

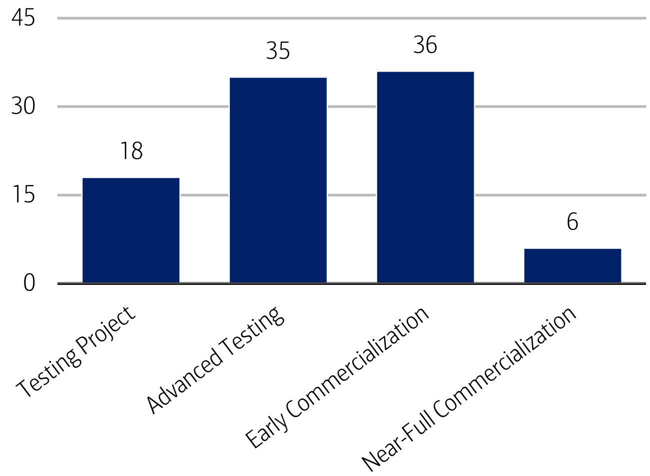
AVs going commercial in trucking, delivery and logistics

As seen in Exhibit 6, there are currently 95 operational commercial vehicle AV projects, of which, 42 are at the early or near-full commercialization stages, measured across five metrics:

1. **Operating on complex routes**: Routes either cross state/country boundaries or require both highway and street driving, validating the ability to handle diverse driving scenarios.
2. **Manufacturer contracts**: Secured contracts with vehicle manufacturer(s), a pathway towards economies of scale and cost efficiency.
3. **Freight provider contracts**: With freight brokers, shippers or carriers, signaling AV developer ability to launch delivery or freight services and generate revenues.
4. **Fully driverless**: Operate without safety drivers, indicating AV tech is ready for deployment without human intervention.
5. **All-time/weather**: Able to operate at all times of the day and in all weather conditions.

No provider meets all criteria yet, but six of the projects meet four, meaning they're at "near-full commercialization." Overall, most deployments are in the long-haul trucking space, likely owing to the easier testing opportunity on highway routes and longer distances (Exhibit 7). According to McKinsey, commercial launches are expected to start in 2027.

Exhibit 6: Of the 95 operational commercial AV projects, 42 are at an early or near-full commercialization stage
Trucking and logistics AV deployments



Source: BloombergNEF as of March 4, 2026, BofA Global Research
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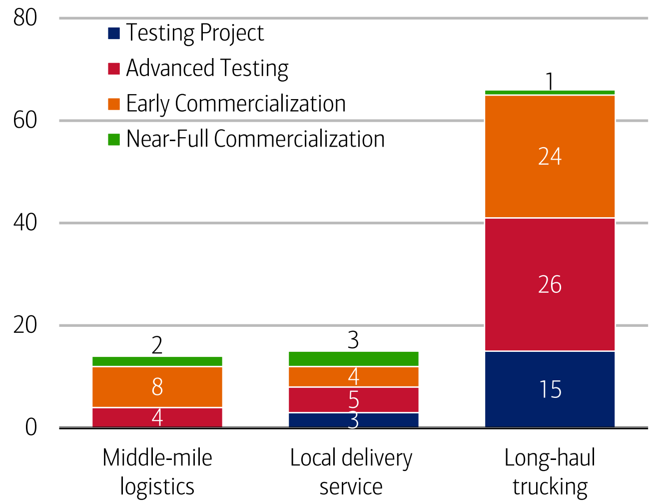
Exhibit 7: There are 66 ongoing long-haul AV truck projects, 25 of which are at some commercial stage
Commercial AV categories with stage of commercialization



Source: BloombergNEF as of March 4, 2026, BofA Global Research
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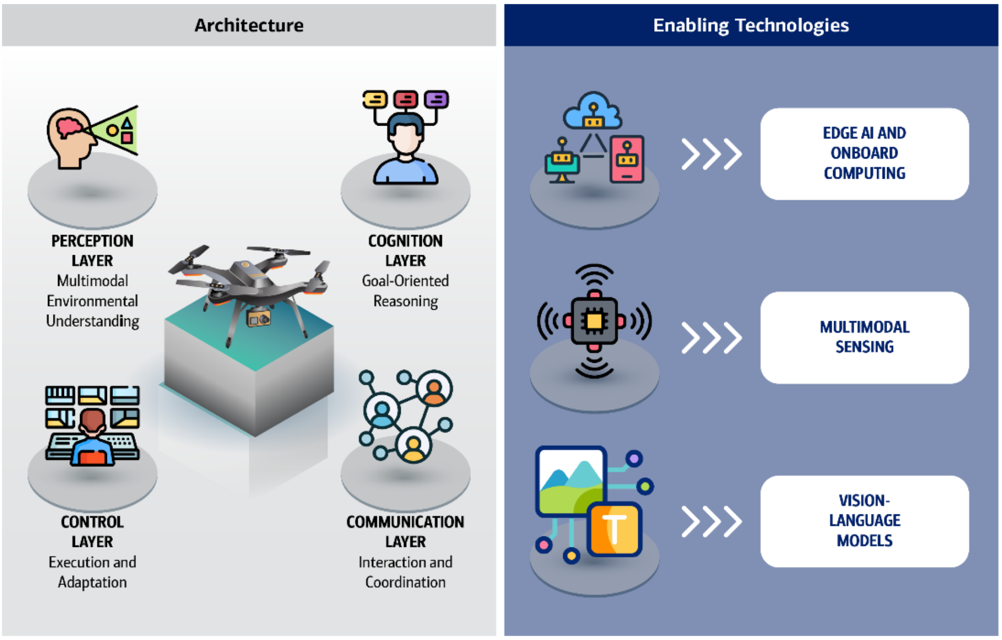
$4 trillion road freight total addressable market (TAM)

Global freight trucking is a $4 trillion annual revenue industry. Asia is the largest market ($1.7 trillion), followed by the US ($0.8 trillion). AV trucks could create over $40 billion in value by 2035 in the US alone, per BofA Global Research – assuming a 10% share of freight miles using AV trucks – a benefit shared between freight customers, freight companies, autonomous software/system developers and truck original equipment manufacturers (OEMs).

Drones: Physical AI is about to take off

Unlike traditional automation or cloud-based AI, drones require continuous, real-time integration of perception, decision-making and control on constrained onboard hardware (Exhibit 8). Latency, power and safety limits force intelligence to operate fully at the edge, with no reliance on persistent connectivity or human intervention. These constraints mirror those faced by AVs, robots and industrial machines, positioning drones as a leading testbed for embodied autonomy rather than a niche application.

Exhibit 8: A combination of advanced AI models, sensing and compute enable drones to operate autonomously
An infographic illustrating autonomous drone architecture and enabling technologies



Source: BofA Global Research
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Highways in the sky enabled by AI and hardware

In order to fly, drones combine robotics and aeronautics technologies, using a mix of propellers, sensors and flight controllers to maintain stability and control. Improvements in onboard compute, perception and navigation systems increasingly enable drones to perform entire missions autonomously, using a combination of GPS (global positioning system), cameras and sensing technologies such as radar and LiDAR (light detection and ranging) – paralleling the technology stack used in AVs on the ground.

Amenable regulation: Beyond visual line of sight (BVLOS)

Despite advances in autonomy, drone delivery was historically constrained more by regulation than by technology. In most markets, commercial drones were required to remain within the visual line of sight of a human operator (BVLOS restrictions), effectively limiting range, fleet size and economic viability. This requirement tied each flight to active supervision, adding labor costs and preventing scalable delivery networks.

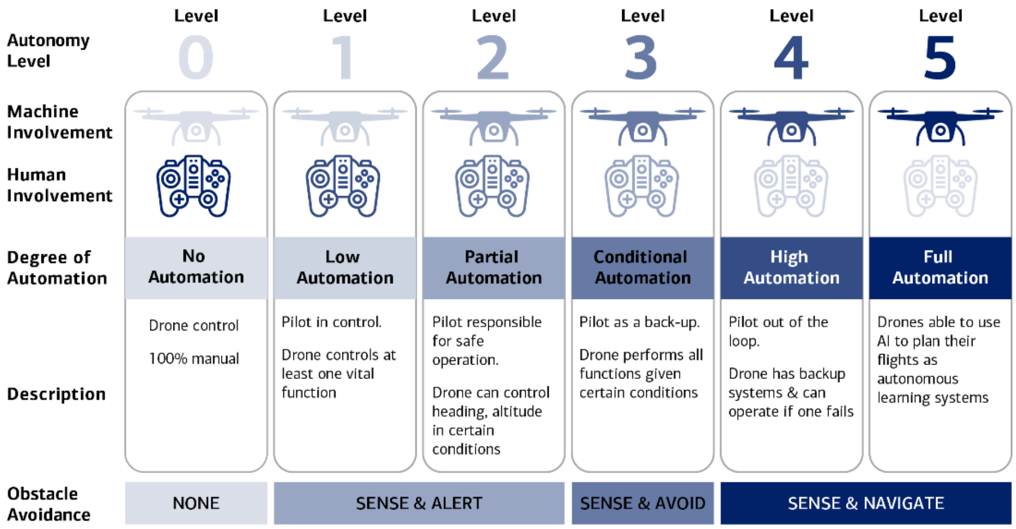
Gradual regulatory change has begun to relax these constraints. Authorities are increasingly permitting drones to operate outside an operator’s direct field of view, provided they can safely plan routes, detect obstacles and remain within predefined operating areas. This shift enables end-to-end autonomous routes, hub-and-spoke delivery models and fleet-level supervision, forming the regulatory foundation for early commercial drone networks.

Just like AVs: Increasing levels of drone autonomy

As with on-road AVs, drones are increasingly classified by levels of autonomy, ranging from limited automation to highly autonomous operation under defined conditions (Exhibit 9). Most commercial deployments have progressed to Level 3 (conditional automation), where drones navigate and avoid obstacles independently, with remote pilots available for intervention. Meanwhile, early Level 4 deployments are emerging in geofenced and tightly constrained environments, enabling largely end-to-end autonomous flight. These systems are being commercialized across mapping, inspection and early delivery use cases, while full Level 5 autonomy remains out of reach due to ongoing reliance on structured airspace and human supervisory oversight.

Exhibit 9: Increasing levels of drone autonomy are driven by tech and regulation

Infographic depicting levels of drone automation



Source: Drone Industry Insights, BofA Global Research

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Drones hit the sky: Delivery, defense and public safety

Drones are now crossing into commercial deployment across several use cases, particularly in the end markets of delivery, defense and public safety. While each market is driven by different demand dynamics, all rely on the same core physical AI capabilities – edge autonomy, real-time planning and control, fleet coordination and safety-critical validation – reinforcing drones’ role as both a proving ground and an operational entry point for embodied AI.

Taken together, these developments point to a structural shift. Drones are forcing governments to rethink how they control airspace, protect infrastructure and manage risk – both in conflict and at home. The result is not just a new category of vehicles, but a new layer of digital and physical infrastructure governing anything that moves through the air.

Commercial drone market: $41 billion in 2025, projected $57 billion in 2030

The commercial drone market (excluding military applications) has already reached meaningful scale, with revenues growing from around $34 billion in 2023 to approximately $41 billion in 2025 and projected to reach $57 billion by 2030.[2] The largest use case thus far is mapping and surveying – particularly in energy, construction and infrastructure – followed by inspection and filming.

Advances in AI-enabled perception, navigation and planning are driving deployment across multiple sectors with commercial applications expanding into agriculture, warehouse logistics and last-mile delivery as tech advances and regulation matures. In agriculture, drones enable precision imaging and automated spraying. In construction and infrastructure, they support high-resolution mapping, digital twin generation and automated aerial surveys. In public safety, drones provide rapid situational awareness and remote assessment, increasingly acting as first responders in time-critical incidents.

When military applications are included, the market is substantially larger. IDTechEx estimates the total global drone market will reach ~$69 billion in 2026, with defense as the single largest revenue segment, reflecting the higher unit costs and system complexity of military platforms. Looking ahead, they project the total drone market could approach ~$150 billion by 2036.

Defense tech: Autonomy reshaping modern warfare

Drones are reshaping modern warfare by delivering outsized impact at low cost. Recent conflicts have demonstrated how commercially derived drones can be rapidly deployed for surveillance, targeting and disruption, often at a fraction of the cost required to defend against them. This asymmetry is shifting military focus away from more sophisticated drones toward detection, tracking and low-cost neutralization.

What are unmanned aircraft systems?

Unmanned aircraft systems (UAS) are now widely integrated into modern airspace, particularly in military operations where they provide intelligence, surveillance, reconnaissance and strike capabilities without putting human crews at risk. In everyday usage, the term “drone” is often used loosely, but it obscures an important distinction: a UAV (unmanned aerial vehicle) refers only to the unmanned aircraft itself, while a UAS includes the full operating system, such as ground control stations, communications links, sensors, software and human operators. Most systems today remain remotely piloted, though advances in autonomy are increasingly enabling drones to operate with reduced human involvement.

From airspace control to public safety

As drones proliferate, low-altitude airspace is becoming a contested domain around airports, stadiums, borders and critical infrastructure. Governments are responding by treating airspace as actively managed infrastructure, supported by digital identification, monitoring and enforcement systems. Regulatory frameworks enabling routine BVLOS operations are also laying the groundwork for both commercial scale and security oversight.

Drone security is also converging with policing and emergency response. Drones are increasingly used by police and fire departments as “first responders” to assess incidents before personnel arrive. At the same time, those same agencies must be able to prevent unauthorized drones from interfering with emergencies, prisons or public gatherings. This is driving demand for integrated platforms that combine airspace monitoring, drone operations, evidence capture and incident management into a single system – blurring the traditional boundary between defense technology and public safety software.

[2] Drone Industry Insights. (2025, March). *Drone Market Report 2025-2030*.

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Disclosures