Transportation
Vehicular Biospheres

KEY INSIGHT

Vehicles are evolving into controlled mobile biospheres that allow people to move through the world and spend extended periods in their cars without subjecting themselves to the elements and contagions.

EXAMPLES

In its 2015 Model X SUV, Tesla designed an air filtration system called Bioweapon Defense Mode that’s allegedly capable of protecting passengers from a military-grade biological attack. The system uses a HEPA filter that can remove particles as small as 0.3 micrometers, roughly the width of a single strand of spider silk. Geely Group says it will spend $53 million to develop cars that purify the air of the cabin and filter out viruses. These sorts of features arrive as vehicular activities like drive-by parties and parades become increasingly common as distanced options for socializing and attending events amid the pandemic, along with an uptick in curbside or in-store pickups for online purchases. The world’s largest drive-through animated light show—in Marietta, Georgia, for the 2020 holiday season—extended 1 mile in length and took 30 minutes to traverse.

DISRUPTIVE IMPACT

The pandemic has made people more sensitive to potential environmental hazards. Many limit their travel source to only their private cars in order to limit exposure. Vehicles as extended personal biospheres or exosuits could necessitate the expansion of dense urban environments and prompt designers to build experiences with the assumption that everyone will participate from within their own personal biosphere.

EMERGING PLAYERS

• Tesla
• Illumination
• Geely Group
Intra-biosphere and intra-pod mobility

Far-future pessimistic scenario
Car customization shops begin adding options for virus safe air-conditioning systems in addition to their existing armor plating and explosive device countermeasures to a-la-carte modifications for the ultra-rich. The option becomes so popular that car manufacturers take notice, creating car-based biosphere isolation specifications for the entire industry to follow. As a result, cars come with biosphere certifications that allow occupants to prove they did not encounter any contagions, so they can speed through any contagion testing or quarantine restrictions.
Battery-Supported Transportation

KEY INSIGHT
The rise of battery-supported transportation will change how we power vehicles, transforming an infrastructure that has historically sourced energy from gasoline to one that delivers it via the electrical grid.

EXAMPLES
Battery-powered transportation now extends beyond cars, trucks, and buses to motorized bicycles, hoverboards, skateboards, and scooters. The battery-powered transportation movement will drive new business models and gradually cut demand for fossil fuel-powered transport. California will phase out the sale of gasoline-powered cars by 2035, making a robust and reliable electrical grid even more critically important in the state. Risks are highlighted by the regular rolling power outages during California’s wildfire season—or Texas’s widespread blackout during a winter storm in early 2021—and are underscored by Tesla’s new in-car warnings to drivers about upcoming power outages nearby.

DISRUPTIVE IMPACT
Energy prices, reliable and safe batteries, and convenient, affordable recharging infrastructure will drive adoption of electric transportation. Utility providers will be pressured to improve grid resiliency as demand grows for domestic charging. Those first movers to provide charging infrastructure along travel routes will shift traffic patterns and create new networked economies—similar to how the interstate highway system created an economic boom for certain towns and hurt those cities that were bypassed.

EMERGING PLAYERS
- Tesla
- ChargePoint
- EVgo
- Blink Charging

Transitioning to grid power from fossil fuels will test energy delivery infrastructure.
Distributed Grid

Mid-future optimistic scenario
Charging infrastructure becomes fully standardized and interoperable. Charging stations become commonplace and are readily available publicly and privately on highways, rural roads, and urban centers. Fast and slow charging is readily available in homes and at charging stations. The electrical infrastructure adapts and offers dynamic energy consumption across the entire system, reducing pollution and delivering cleaner energy than its petroleum-based predecessors.

The grid becomes distributed, scalable, and self-routing in a manner that maximizes efficiency and safety. Consumption can be predicted and mapped very accurately, reducing peak load and overcapacity needs. Systems are designed and developed where batteries and devices connected to the grid can receive and return power as needed in an open ecosystem.

Competing Standards

Mid-future neutral scenario
Charging infrastructure develops regional level interoperability with one or two primary standards to which all-electric vehicles can connect. Public charging stations concentrate around interstate highways and urban centers, driven by the adoption of upper-middle-class commuters and commercial trucks. Most of the charging happens at home with residential charge points. Electricity infrastructure has a limited adaptation to the increased demand. Power generation continues with limited decreases in overall pollution. Utilities aggressively incentivize consumers to shift electricity demand across non-peak times by limiting fast charge times and conditions. Blackouts and brownouts become more common and predictable like snowstorm and fire disruptions… inconvenient, but generally accepted.

VHS vs Betamax, But for Cars

Mid-future catastrophic scenario
Energy infrastructure delineates the have from the have-nots. The charging networks are not interoperable, and we develop dongle hell for cars. Fragmentation persists until there is market saturation and the government steps in, mandating interoperability. Think Apple iPhone forcing people to buy Bluetooth headphones versus Android phones, only this time it is Tesla versus Volkswagen.

Fuel for power plants and electricity generation does not adapt, so the electricity powering our transportation is less efficient and more polluting than the gas-powered cars they are replacing. We become increasingly dependent on the outdated infrastructure that begins to decay at an increasing rate under the new load causing frequent brownouts and blackouts. States and municipalities begin to compete on delivering power, redistributing population centers, furthering divisions of wealth and opportunity.
Technology companies are building operating systems for the cockpit.

**KEY INSIGHT**

Platforms are building operating systems for smart cockpits.

**EXAMPLES**

Amazon, Apple, and Google are competing to gain a foothold in the auto entertainment industry as carmakers incorporate smartphones directly into driving interfaces. Amazon’s Alexa Custom Assistant was developed for the enterprise: Companies such as Stellantis are using it to develop their smart cockpits. Volvo’s Polestar 2 uses the Android Automotive OS custom-built by Google.

**DISRUPTIVE IMPACT**

The major platform players increasingly view car ecosystems as prime real estate not only for customer attention but for data collection. As consumers spend more time in their cars without as much need to pay attention to actually driving, carmakers must decide whether to design their own systems and compete with tech titans or to give up ownership of the infotainment dashboard to third parties. The applications available on each car platform will likely determine adoption and ultimately decide the market winners and losers.

**EMERGING PLAYERS**

- Tesla
- Google’s Android Automotive OS
- Amazon’s Alexa Custom Assistant
- Apple’s CarPlay
KEY INSIGHT
The business models for transportation are shifting to subscription and pay-per-use structures, as bike, scooter, and car ride-sharing services become more common.

EXAMPLES
The business model of ride-sharing services Uber, Lyft, Via, and Gett now extends beyond cars. Citi Bike provides rentals of electric and non-electric bicycles, while Bird, Spin, Skip, eCooltra, and Turo offer scooter rentals. Car rental companies like Hertz, Avis, and Sixt now offer rentals by subscription, by the minute, or by the mile in specific urban centers. Carmakers are also testing new ownership models, such as Audi Select, Access by BMW, Genesis Spectrum, Porsche Drive, and Porsche Host.

DISRUPTIVE IMPACT
The high upfront investment, maintenance costs, and rapid depreciation associated with traditional car ownership will dissuade potential car owners as they avail themselves of transportation options with subscription models or per-use rates. Consumers will likely demand business models that are personalized and maximize flexibility and cost-efficiency.

EMERGING PLAYERS
- Gett
- Via Transportation
- Sixt

What year will fleet-owned autonomous cars outnumber family-owned cars in the U.S.?
Forced Updates

KEY INSIGHT

In an ideal world, keeping software updated ensures the safest and best experience possible. But in reality updates are often mandatory and sometimes cannot be postponed or avoided, meaning they can unexpectedly take systems offline, force unwanted changes, and expose users to unforeseen bugs and vulnerabilities.

EXAMPLES

Forced updates can be either good or bad. When Tesla issued an update to its Model 3 that improved braking distance by a full 19 feet, that was good. When Microsoft’s Windows 10 forced an unannounced mandatory restart in the middle of a professional gamer’s livestream to 130,000 followers, that was not good. Microsoft has since rethought its policy of forced updates.

DISRUPTIVE IMPACT

When a provider like Microsoft or Google changes a keyboard shortcut or switches the delete and archive button, frustration often ensues. Now imagine if Tesla reprogrammed which button or pedal sounded your horn, or applied your brakes—the result could be catastrophic. Or say you’re in a rush to a critical meeting, but because of a billing hiccup on your car’s lease, security software suddenly kicks in that restricts your maximum speed to 65 mph. Automotive platforms will evolve continuously, with new features and functionality added via over-the-air firmware updates. Providers will increasingly navigate the difficult path of introducing new features to keep pace with evolving technologies and improving customer experiences, while ensuring major changes are introduced gradually enough to avoid creating new user-error risks.

EMERGING PLAYERS

• Tesla
• Amazon
• Google
• Apple
• General Motors
• Microsoft

A driver attempts to diagnose engine problems on his own in the middle of traffic.