

TECHNOLOGY TRENDS AND THE FUTURE OF TRAVEL

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Global Auto & Truck Markets

Autonomous Driving and the Future of Travel

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Today's Agenda

- **Introduction** – why now?
- **Availability** – when will self-driving cars arrive?
- **Adoption** – how quickly will this proliferate?
- **Implications** – what might this mean for future cities and living?

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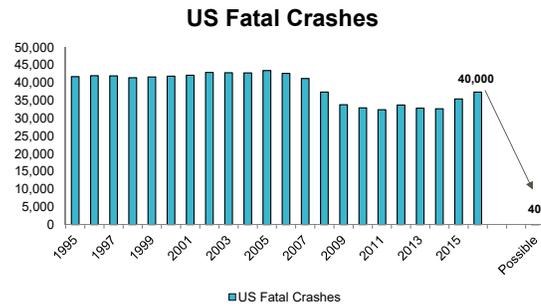
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Introduction

- **Why now?**
- U.S. traffic fatalities have increased two-consecutive years
- Technology in development today has the potential to virtually **eliminate** traffic accidents



Source: NHTSA, Mobileye

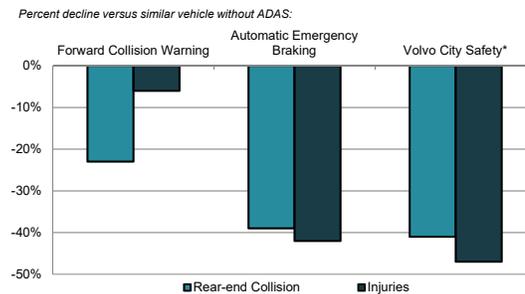
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Introduction

- **Why now?**
- Even the intermediate step of offering *active safety* and *highly automated driving* offers immense societal benefits



Source: IIHS

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Availability

- **When will this arrive?**
- Automakers have a clear product development roadmap of offering higher levels of autonomy
- Until this year, safety systems required constant human monitoring of the driving environment
- The all-new Audi A8 is the first vehicle where human involvement is not a constant requirement (depending on the specific driving task)



Source: Audi

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Availability

- **SAE defines five levels of automated driving**



Source: SAE

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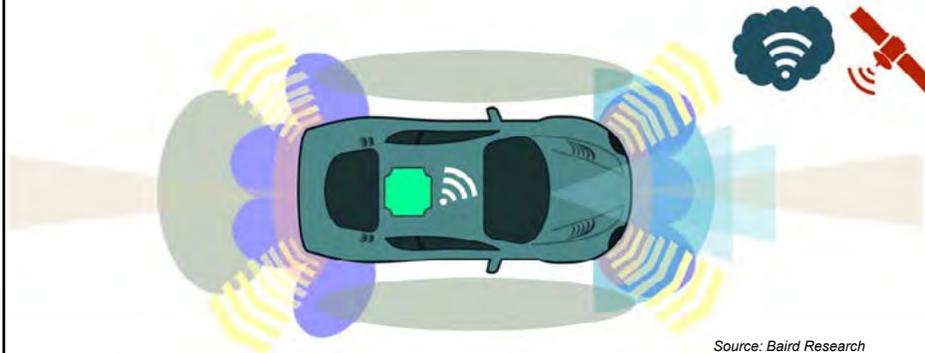
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Adoption

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- The “core” hardware for automated driving is available...but costly
 - Tier 1 suppliers estimate \$5,000+ of system cost to the OEM to achieve Level 4 capability in 2020



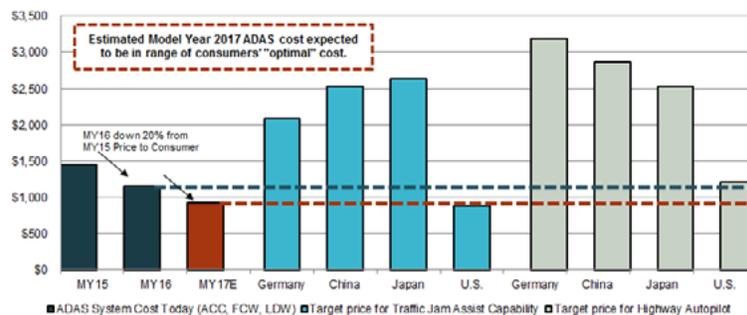
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Adoption

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- Significant strides to reduce costs already being achieved
 - Driver assist has already achieved optimal price for mass adoption in most regions of the world



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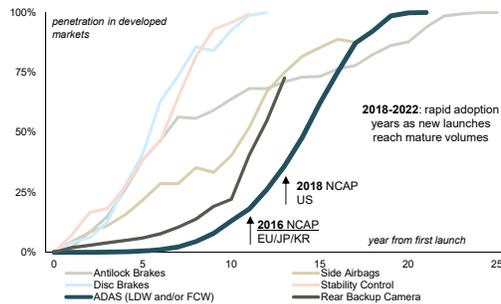
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Adoption

- **Technology adoption follows an S-Curve**
 - Without regulation, technologies proliferate over 4-5 design cycles or 20-25 years
 - With mandates, adoption can be much quicker (~10 years)
 - Assuming “normal” adoption curves, **Level 4/5 vehicles proliferate by 2040-2050**

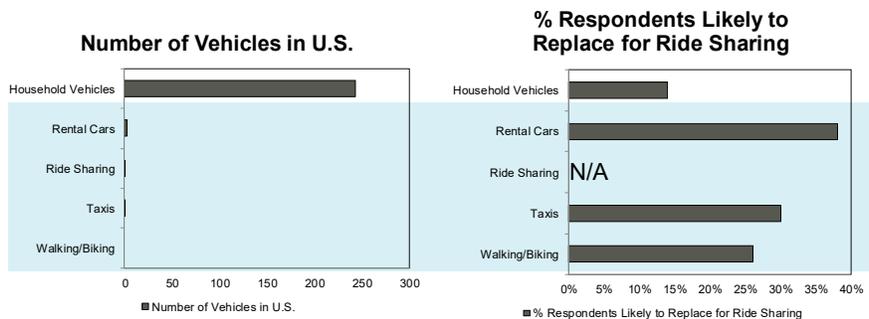


Source: Baird Research, Ward's Automotive

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Implications

- **Baird's view:** people will continue to own cars, whether driven or autonomous
- **Autonomous shared mobility disrupts... shared mobility**



Source: DOT, KBB, Baird estimates

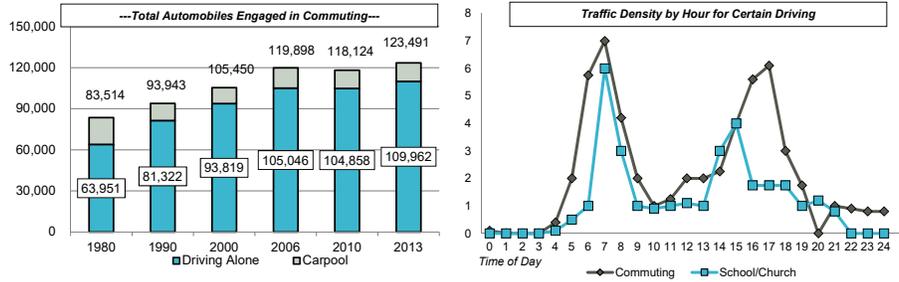
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Implications

- **Typical vehicle use case (i.e., commuting) prevents greater reductions in fleet density**
 - Vehicles are utilized at the same time each day

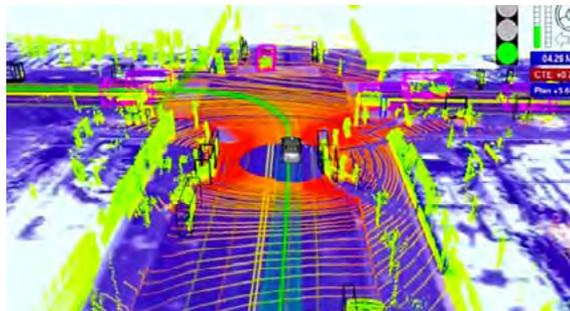


Source: US Census Bureau, FHWA

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Implications

- **Greatest changes to travel likely to come in high density areas...**
the very environment Level 4 vehicles are first being deployed



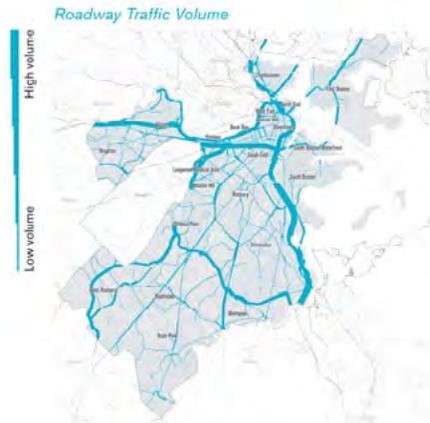
Source: Alphabet, IEEE

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Implications

- **Case Study:** "Go Boston 2030"
- Commute (one-way): 29 minutes
- Primary transport: Driving alone (39%)
Public transit (34%)
Walk/bike (20%)
Carpool (6%)
- Trips ending in Boston: 395,300
- Accidents: 200+ per year



Source: City of Boston, Central Transportation Planning Staff

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Implications

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Benefits

- **Productivity** (1.2B hrs of driving saved)
- **Traffic efficiency** (30% reduction in time)
- **Traffic density** (10-30% fewer vehicles)
- **CO2 Emissions** (down ~70%)
- **Parking** (40-50% fewer spaces)
- **Safety** (90% fewer accidents)

Source: BCG

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**Great outcomes.
Done well.**

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