

ADAS in the driver's seat

The domestic market for passenger vehicles
with ADAS to cross \$1 billion by fiscal 2028



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AI makes big inroads into Motown

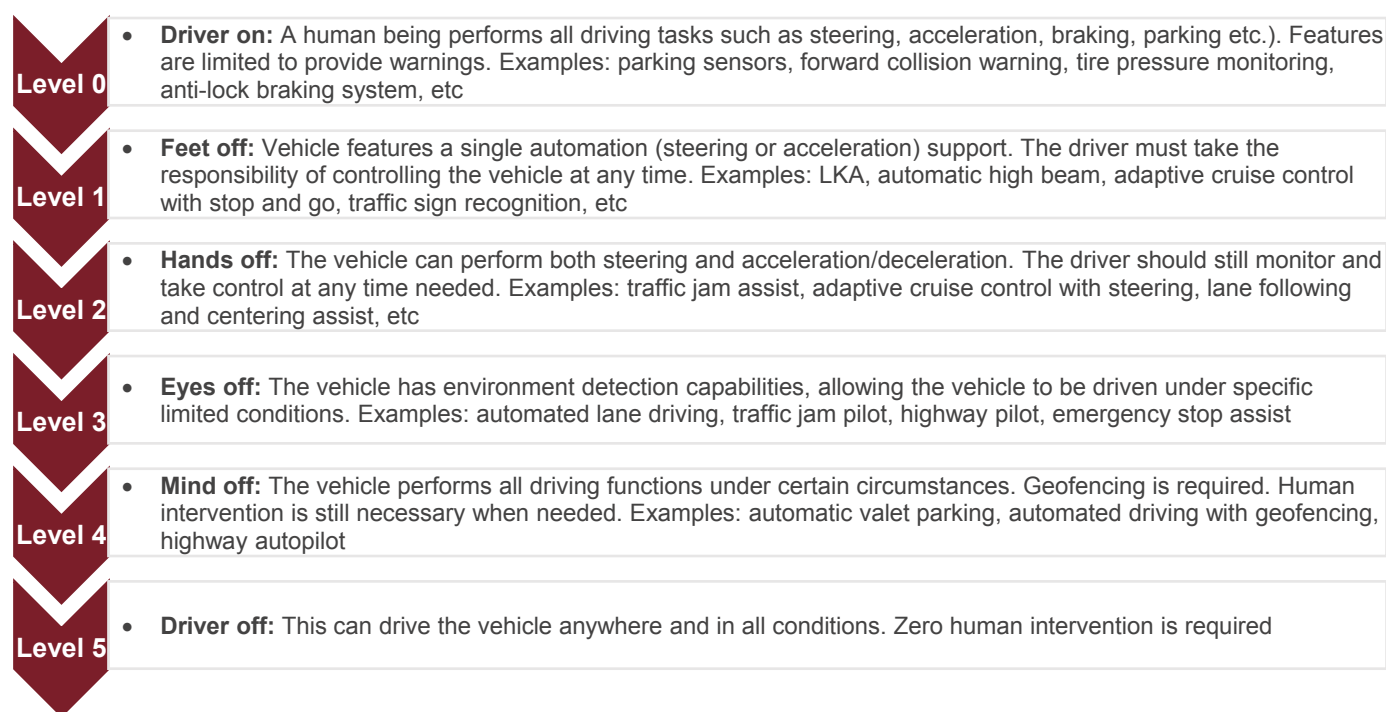
Artificial intelligence (AI) is fast becoming one of the most important technologies of our time. With its rapid evolution, AI has paved its way into almost every sphere of life.

The auto industry, especially, has seen AI make a mark with cutting edge technology and new innovations. advanced driver assistance systems, or ADAS, is one such example.

It is a set of technologies used in cars for safely operating the vehicle. It aids the driver in steering, braking, accelerating, parking, navigation and alerts them of any potential hazard.

ADAS employs several sensors, cameras, and methods to perform various functions such as adaptive cruise control (ACC), lane keeping assist (LKA), automatic emergency braking (AEB), blind spot detection (BSD), pedestrian detection, parking assistance, adaptive headlights, etc.

ADAS has various levels depending on the degree of automation that a vehicle has been programmed to perform:



One of the primary benefits of ADAS is its potential to prevent accidents. Systems such as AEB can swiftly detect an impending collision and initiate braking, reducing the risk of rear-end crashes.

Moreover, features like lane departure warning (LDW) and LKA help drivers stay within their lanes, mitigating accidents caused by unintended lane drift.

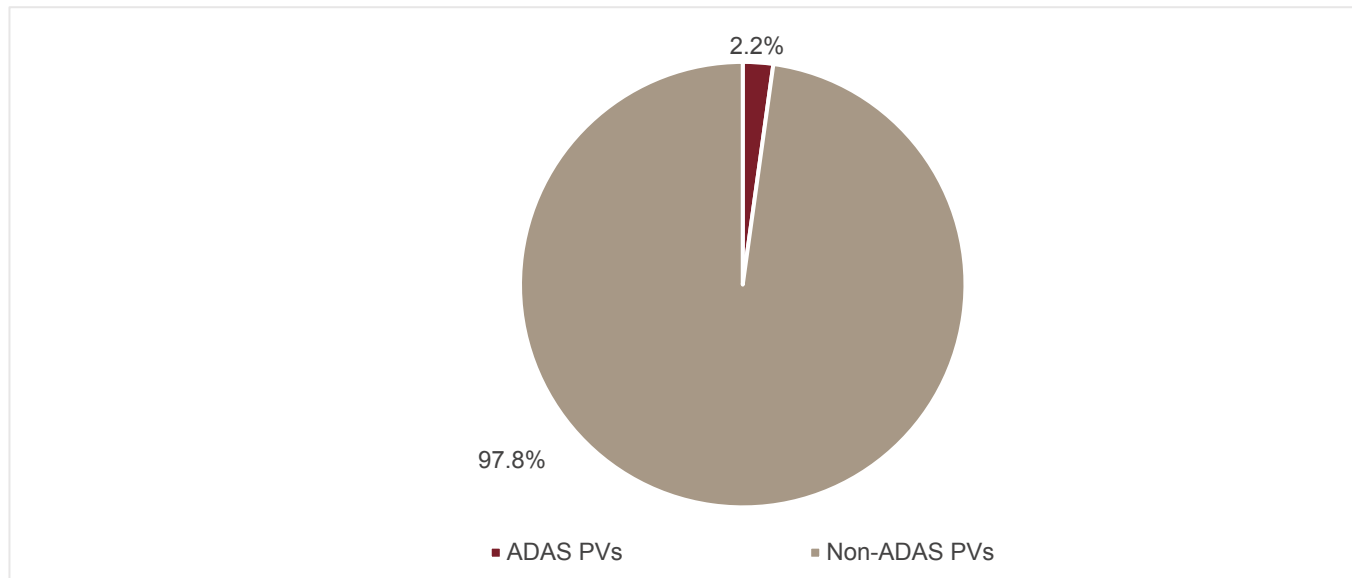
ADAS penetration in India in the passenger vehicles segment

Mahindra & Mahindra and Morris Gararages drive adoption

Globally, ADAS has been used rampantly for long, with the US, China and Europe leading innovations in the technology. The trend has been picking up in India as well, with passenger vehicles (PVs) with ADAS features contributing to almost 2% of total PV sales in the country as of fiscal 2023.

As per CRISIL's assessment, home-grown manufacturer Mahindra is leading the pack in terms of market share with its XUV 700 model at 40-50%, followed by Morris Garages with its four models (Astor, Hector, ZS EV, and Gloster) at 20-30%, and Honda at the third spot with its Honda City model at 10-20%. Players such as Tata Motors, Hyundai, and Toyota have made humble beginnings, accounting for the balance share in the total ADAS-enabled PV sales for fiscal 2023.

ADAS penetration in India in the PV segment, fiscal 2023



Source: CRISIL MI&A Consulting, industry

OEMs	Player-wise market share (FY23)
Mahindra	40-50%
Morris Garages	20-30%
Honda	10-15%
Tata Motors	5-10%
Hyundai	<5%
Toyota	<5%

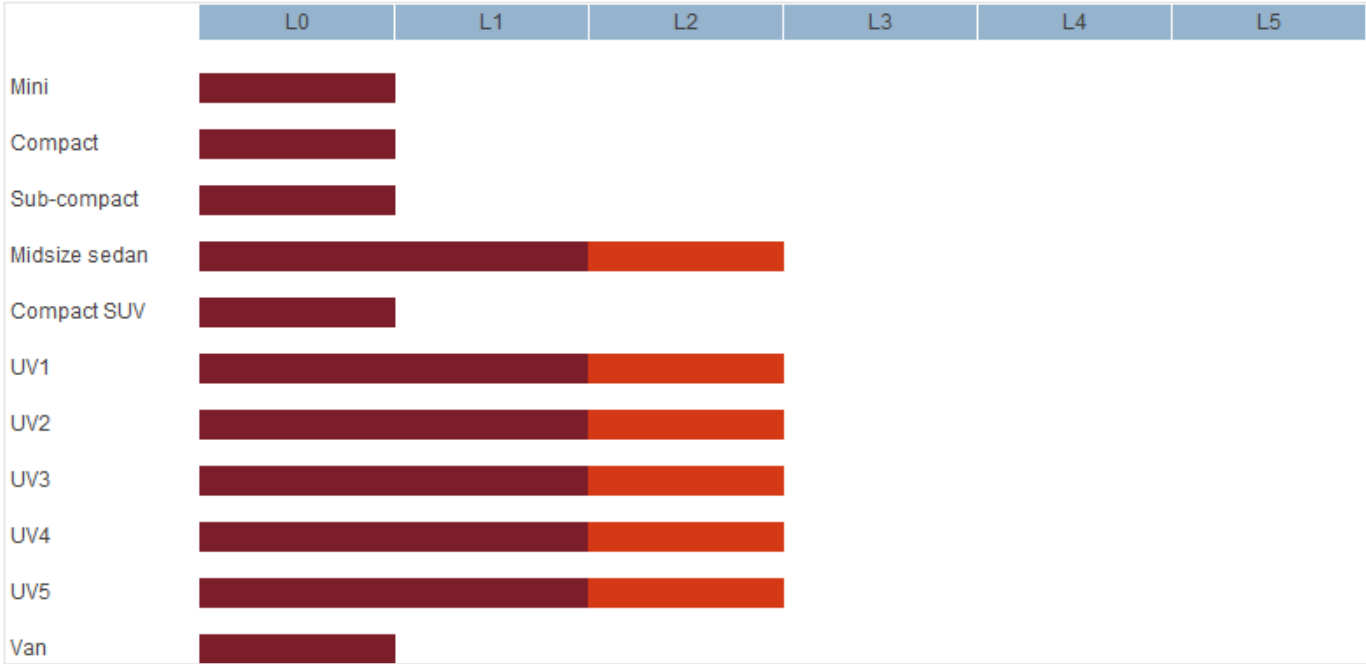
Source: CRISIL MI&A Consulting, industry

Levels of automation/ADAS systems in India

The Indian automobile industry is at a nascent stage in terms of penetration of PVs with ADAS features, with home-grown players like Mahindra and Tata making a dash, along with international players such as MG, Honda and Toyota.

The current level of automation in India suggests that the automation technology levels L1 and L2 are making inroads, mainly in the premium SUV and sedan segments, which account for almost one-fourth of PV sales in the country. On the other hand, adoption in the hatchback segment is minimal, with the adaption level still at L0.

Current level of automation/ADAS systems across segments in India

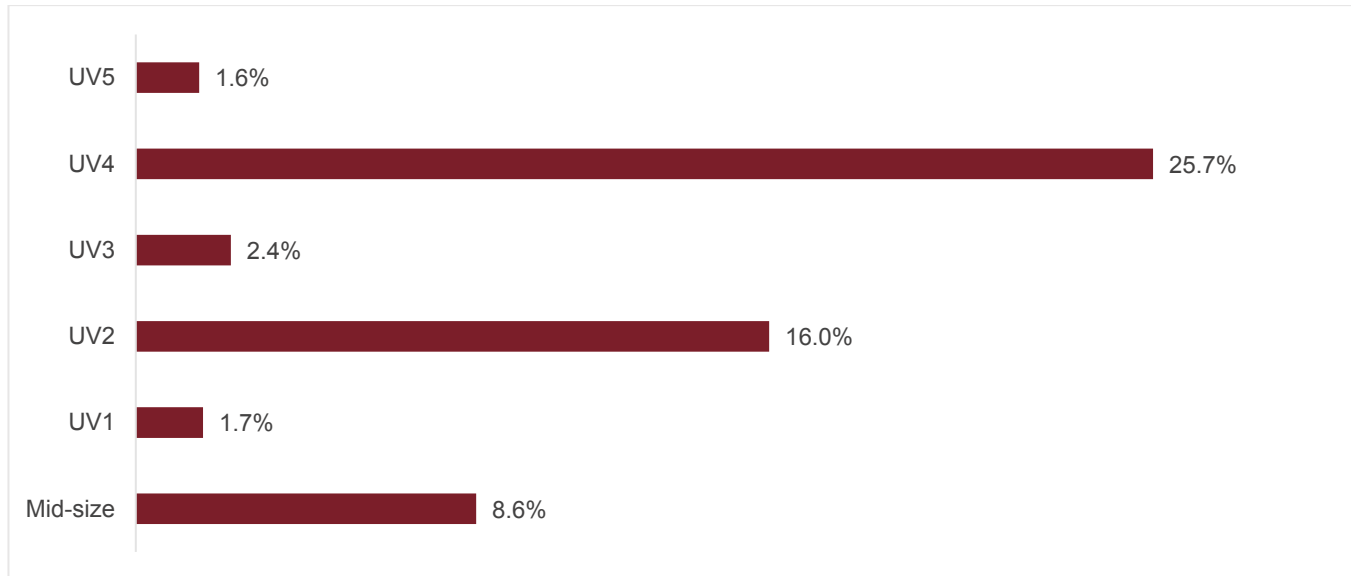


Source: CRISIL MI&A Consulting, industry

The premium SUV segment (UV2) (models – Mahindra XUV700, MG Hector, Tata Harrier, Tata Safari) account for two-thirds of total ADAS PV sales, followed by the entry level SUV segment (UV1) (models - MG Astor) and midsize segment (models – Honda City and Hyundai Verna).

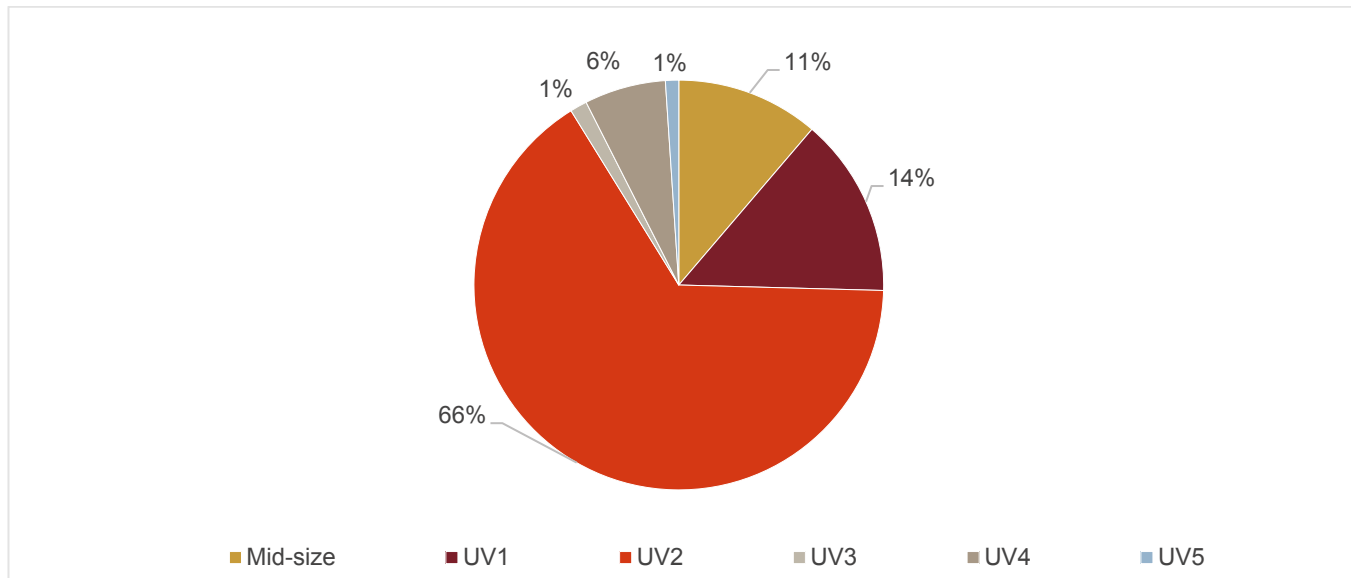
These three segments form over 90% of ADAS PV sales, indicating minimal adoption in hatchback and other premium SUV segments.

Segment-wise sales penetration of ADAS models (FY23)



Source: CRISIL MI&A Consulting, industry

Segment-wise break-up of ADAS PVs



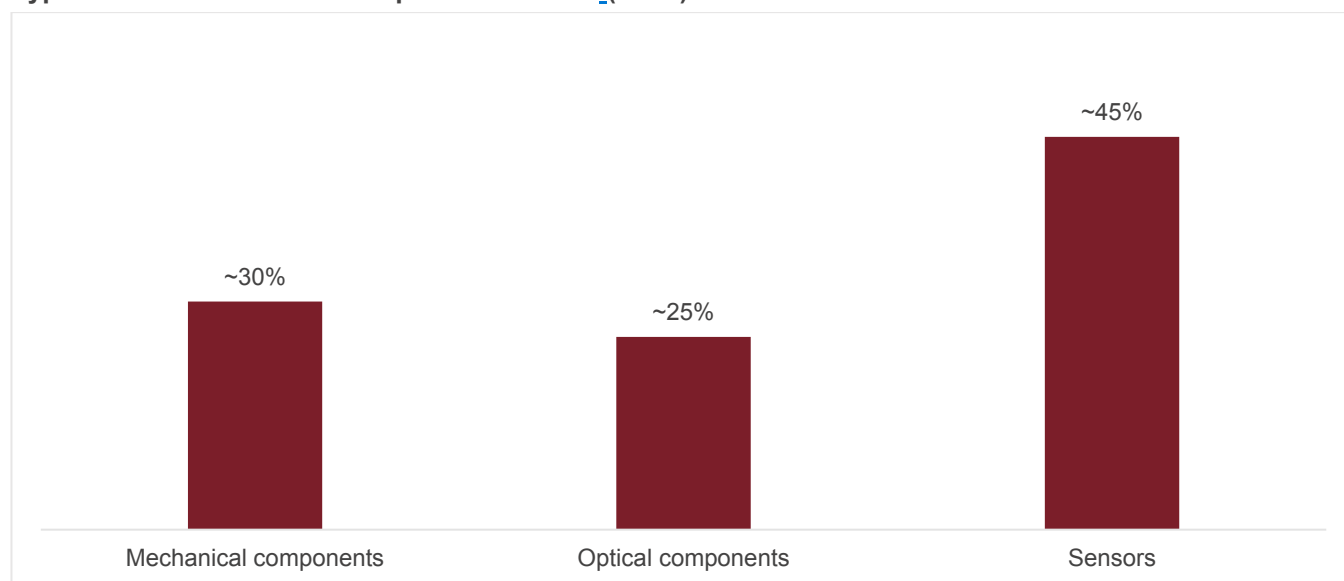
Source: CRISIL MI&A Consulting, industry

Typical cost mix in ADAS components

ADAS components fit broadly in three groups — mechanical, optical and sensors. Mechanical components are the ones which enable ABS, ESP, TCS and cluster warning, while optical components mainly involve the camera systems. The sensor modules provide the most advanced safety features in the ADAS ecosystem.

Over the past few years, there has been a huge leap in the innovation of radar sensor modules. There is a wide array of choices, including long, medium, short, and ultra-short-range sensing capabilities, as well as various radar frequencies and LIDAR technology. The cost of sensor components is the most at ~45%, followed by mechanical at ~30%, and the balance ~25% is contributed by the optical components group.

Typical cost mix in ADAS components in India (FY23)

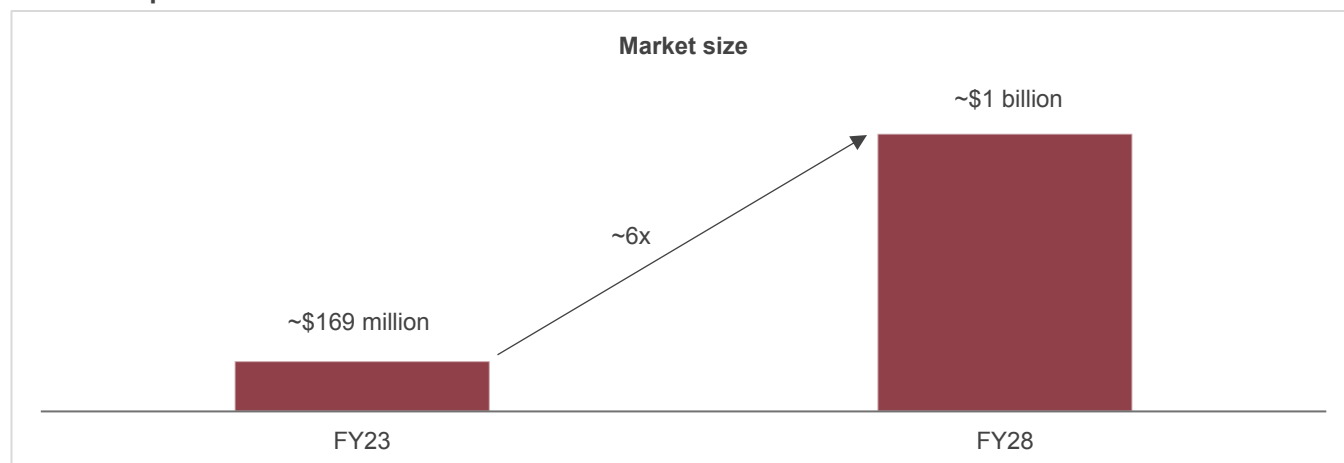


Source: CRISIL MI&A Consulting, industry

Market size of ADAS components to grow over six times by fiscal 2028

Based on primary interactions with industry players across OEMs, and after an extensive analysis of the model-wise cost of the ADAS components, CRISIL MI&A pegs the market size for ADAS components at ~\$169 million for fiscal 2023, which is projected to grow to ~\$1 billion by fiscal 2028, up six times over the fiscal 2023 market size.

ADAS components market size in India – current situation and outlook



Note: Sizing is based on the Society of Indian Automobile Manufacturers’ sales of domestic passenger vehicles and not luxury brands like Mercedes, BMW, Audi, JLR, Volvo, etc.

Source: CRISIL MI&A Consulting, industry

Based on CRISIL’s assessment and interactions, mid-size and UV segments are expected to register the highest ADAS penetration at 15-20% and 10-15%, respectively, by fiscal 2028, growing from 5-10% and 4-8% as of fiscal 2023. Compact UV and hatchback/small cars segment will also see an increase of 6-10% and 4-6%, respectively, in ADAS penetration by fiscal 2028 from 0% and 1%, respectively, as of fiscal 2023.

As per CRISIL's assessment, by fiscal 2028, of the total PV sales with ADAS features, about 55-60% are expected to be utility vehicles, followed by compact utility vehicles at 20-25%, midsize at 10-15% and balance 3-7% by hatchbacks/small cars.

The growth in India's road infrastructure greatly benefits the implementation of ADAS. With increasing efforts by the Government of India to convert existing highways to expressways, roads are destined to become well equipped with the necessities for ADAS to flourish.

Expressways typically have their standard markings, signages, lane markings, and consistent roads. Standardisation often leads to uniformity and predictability, which can contribute to smoother processes, which bodes well for ADAS.

Expressways can be equipped with the necessary sensors and communication protocols that will allow advanced technologies, such as adaptive cruise control, LKA, and automated braking in ADAS-equipped vehicles to operate more effectively. This technology would eventually transition to vehicle-to-vehicle and vehicle-to-infrastructure connectivity, thereby expanding the market and enhancing the driver's experience.

Few chinks in the armour

While the outlook for the industry looks bright with penetration increasing as more and more customers demand autonomous and safety-rich features, some challenges remain, which need to be addressed, for the industry to realise its full potential.

Challenges in ADAS penetration

Extensive road infrastructure with proper lane markings are needed.
Most local roads in India have no lane markings

Signboards are not positioned properly, not well maintained for the cameras to read them clearly

Standardisation and regulations need of the hour to boost confidence among players in the whole ADAS ecosystem

Addressing one of these challenges, the Ministry of Road, Transport and Highways recently introduced fresh directives pertaining to signages on national highways and expressways, with the aim of improving road safety standards, ensuring better visibility, and providing intuitive directions to drivers. The guidelines will be implemented in a phased manner on all upcoming highways, expressways and greenfield projects.

Additionally, as electric vehicles (EVs) become more common, the overall vehicle fleet will become more modern and safety conscious. ADAS features are a good fit for the emphasis on safety in EVs, and they could become standard or desirable options.

In addition, regulations and incentives may encourage the adoption of ADAS in EVs; consumer demand for advanced technology could also drive sales. Finally, the development of autonomous driving is supported by ADAS technologies, which could further increase demand for these features.

Just as AI is poised to shape the future of the world, ADAS stands to revolutionise the automotive landscape in ways that are nothing short of transformative. It is both the forerunner and enabler of a safe and autonomous future. The path to self-driving cars may indeed be challenging with technical intricacies and regulatory frontiers, but with each passing year, the autonomous mobility envisioned is only getting closer.

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ADAS

In Commercial Vehicles

Q2'20 Pulse

What's inside ?

1. Activities of 4 key **commercial vehicle manufacturers** in ADAS and higher autonomy
 - Tesla, Daimler Trucks, Traton and Volvo Trucks

Activities of 4 key **emerging players** in autonomous CVs

- Embark, TuSimple, Nikola Motors, Einride

2. **Regulations** impacting autonomous CVs in the U.S & EU
3. **Future outlook**



MOBILITY INDUSTRY
INSIDER

Image: Daimler Freightliner Inspiration Truck

FutureBridge

THEMES AND KEY TAKEAWAYS IN ADAS in CVs

Today, we are seeing vehicle automation quickly becoming available throughout the commercial vehicle market with significant interest and investment by the players.

ADAS functionalities such as adaptive cruise control (ACC), automatic emergency braking (AEB) and lane keeping assist (LKA) are accelerating for commercial vehicles. Truck platooning is anticipated to be one of the next technologies to commercialize in this space.

Higher levels of promise to improve driver safety and commercial fleet efficiency, but technological challenges and regulatory barriers still exist.

Themes covered in this scope



Activities of 4 key commercial vehicle manufacturers in ADAS & higher autonomy

- [Tesla](#)
- [Daimler Trucks](#)
- [Traton](#)
- [Volvo Trucks](#)



Activities of 4 key emerging players in autonomous commercial vehicles

- [Embark](#)
- [TuSimple](#)
- [Nikola Motors](#)
- [Einride](#)



Regulation impacting autonomous commercial vehicles in the U.S and EU

- National standard for autonomous trucking in the [U.S](#)
- [EU](#) Roadmap for Truck Platooning



Future outlook

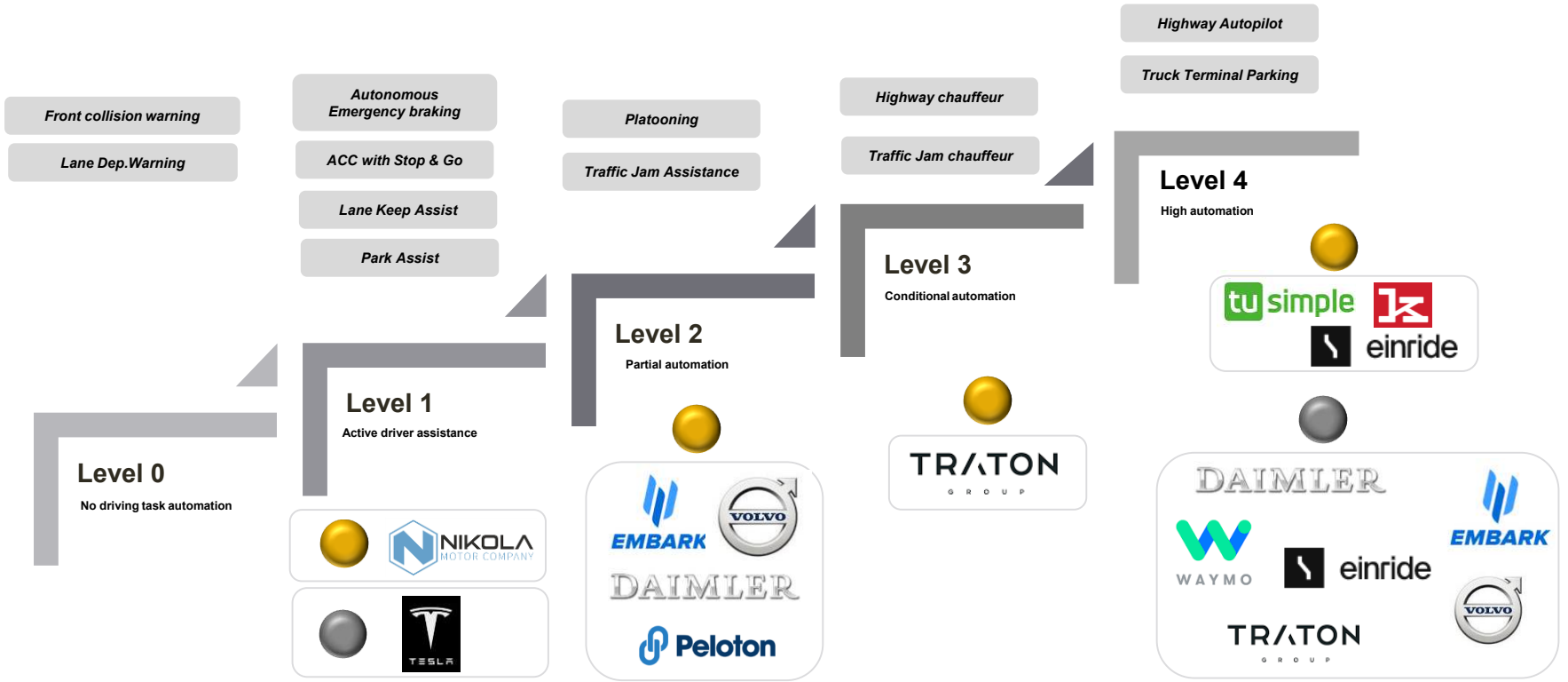
- Rise in capacity of freight overloads
- Focus on safety first with driver assist
- Need for clean, power efficient tech
- Adoption of next-level platooning
- New legal and insurance framework

Key Takeaways

- Players are focusing on **Level-4 technologies** that take over on the highways, aiming at improving safety and gaining greater fuel efficiency. e.g. from platooning.
- **Collaborative business models** and **investments** could accelerate L4-L5 capabilities in the near future and find use cases in last-mile delivery, construction and mining areas
- Players like **Embark** plans to skip **Level 3** and go straight to **Level 4**, while **TuSimple** has ambitious plans to scale up Level 4 freight network by **2021**
- **Hydrogen** powered autonomous trucks could gain traction and fuel the freight chain
- Currently, **no federal regulation** on autonomous trucking technology exists in **the U.S.** which raises concerns over the need of design variants among states
- **EU** is developing platooning technology and relevant standards for **multi-brand platooning**
- As trucking moves **70%** of all goods in the U.S, **automation in trucking** has a good potential to scale the freight delivery operations
- Two-truck [platooning](#) system aims to reduce the fuel consumption for lead truck by **4.5%** and rear truck by **10%**

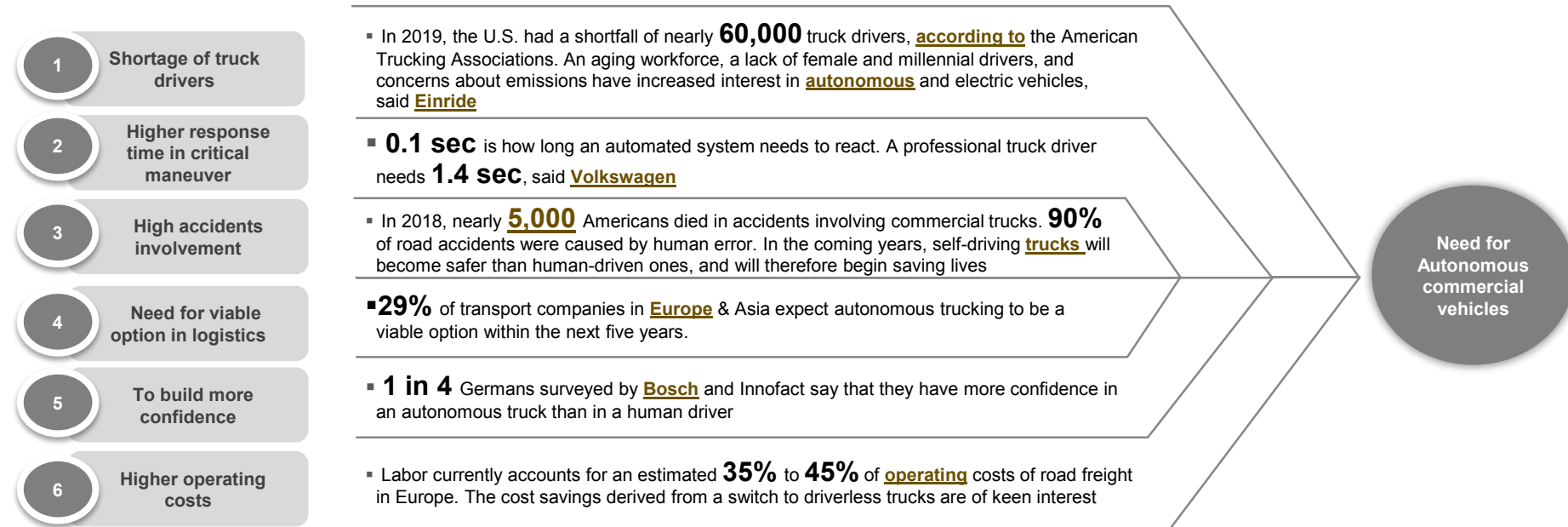
Autonomy in Commercial Vehicles Transportation

Several enabling technologies for ADAS & autonomy are in planning or deployment phase. One of the key automation strategies here will be the deployment of truck platoons.



Need for autonomous commercial vehicles

Shortage of truck drivers & enhanced safety requirements are critical for the future of Commercial Trucks. There is need for ADAS to shift from accident mitigation to prevention. Players will look for more cost-effective solutions in the future.



Need for
Autonomous
commercial
vehicles



"We are the pioneer for automated trucks. With the formation of our global Autonomous Technology Group, we are taking the next step, underscoring the importance of highly automated driving for Daimler Trucks, the industry and society as well. With the new unit, we will maximize the effectiveness of our automated driving efforts and the impact of our investments in this key strategic technology." ~ Martin Daum – Member of BOM of Daimler AG for Trucks & Buses

01

Commercial vehicle manufacturers activities in ADAS and higher autonomy



Upcoming Trend

- Trial and roll-out of Level 4 autonomous vehicles, with increase in number of variants offering specific requirements
- Collaborative business models are gaining traction between players to scale their autonomous capabilities
- Investments will fuel to accelerate Level 4 – Level 5 capabilities in the near future where players will be seen offering autonomous capabilities in last-mile delivery, construction and mining areas



Players in our coverage

Below players are selected as they hold the largest share in commercial vehicle sales globally



Commercial Vehicles



What do we see happening

- Dominant players like Daimler, VW, Volvo are investing heavily in their autonomous technologies in commercial vehicles segment. Few of them have started dedicated business units for ACVs
- Players are focusing on technologies that take over on the highways, improving safety and gaining greater fuel efficiency
- Several other players are expanding their technological capabilities through collaborative business models to develop smart and secure solutions for logistics and transport

Summary of OEMs activities in commercial vehicles

With L2 capabilities at present, plans to trial & roll-out L4 with focus on safety and increase number of autonomous variants

Parameters selected for competitive analysis



	TESLA	DAIMLER	Commercial Vehicles TRATON GROUP	VOLVO
ADAS functionality	Plans to offer 'Autopilot' capabilities in Semi trucks in 2021	Offers L2 capabilities with Active Drive Assist & Detroit Assurance 5.0	Offers L3 capabilities in Australia mine. Testing of L4 vehicles on the German Autobahn	Offers L2 capabilities with Active drive assist platform. L4 testing for Vera in geo-fence area
Number of CV models offering L2	1 – Semi, which is offered in two variants of 300 & 500 miles range	Total 3 models which includes Freightliner Inspiration Truck, New Actros, Fuso Super Great Trucks	Total 3 models which includes MAN, Scania & Caminhões e Ônibus	Total 3 models which includes Vera, FMX trucks, VNL 670 model tractors
Safety aspects	Emergency call services, forward collision warning, emergency braking	Active Brake Assist 5, Sideguard Assist, Proximity control assist, Crosswind assist	MAN aFAS Driverless safety vehicle	Active drive assist platform VADA 2.0 , with driver awareness support
Collaborative business models				
Future Outlook	Plans of commercialization of Semi trucks by 2021, with 1,00,000 trucks to be produced in a year	Ambitious plans to roll-out Mercedes-Benz future truck 2025, with L4 capabilities	Solid investment plans of €1B in R&D by 2025, aiming for L5 capabilities by 2022	Roll-out of full Self-driving FMX trucks in the future,

OEM activities in commercial vehicles (1/4) : Tesla

Semi's production is delayed until 2021. Tesla plans to commercialize with autopilot functionality and offer at least 500 mile range

Source : [Tesla](#)



Image: Tesla Semi

Tesla Semi comes with an 'Autopilot' function to help provide assistance with semi-autonomous and safety for truckers

Trial Since	2017
Commercialization	2021
Variant Name	Semi

Future plans

100,000
trucks to be produced in a year



Image: Driver Cabin view of Tesla Semi

Tesla Semi Autopilot

Semi will use a range of cameras and sensors to help the computer systems onboard the truck to monitor its surroundings >>

Lane Keep Assist

Forward collision warning

Emergency braking

Emergency services call

Active steering assist

Not exhaustive list

Orders received for Tesla Semi

125		40	
100		15	
50		10	

In whole numbers

Cost vs range of Tesla Semi

\$150,000 300 mile range

\$180,000 500 mile range

\$200,000 Limited edition 'Founders series' model

Company claims

\$200,000

Saving the operator fuel costs of over a two-year period >>

\$1.26

Total cost per mile of Tesla Semi as compared to a diesel truck of \$1.51 >>

<2 Kwh

Per mile less energy consumption

Press Release

Tesla Semi Production is delayed until 2021 – electric truck now 2 years late >>

Range of Tesla Semi

500 miles at maximum load at highway speed is what Musk has promised, saying that 80 % of routes are less than 250 miles anyway – which means trucks can go out and back without charging >>



FutureBridge Analysis

ADAS functionality

Number of CV models offering L2

Safety aspects

Collaborative business models

Future Outlook

= Strong Capability

= No capability

OEM activities in commercial vehicles (2/4) : Daimler

With collaborative business models, increase in investments, Daimler aims to roll-out L4 autonomous capabilities in the near future

Source : [Daimler](#)



Image: Fuso Super Great Trucks

ADAS Availability



Image: Freightliner Inspiration Truck



Image: New Actros

Trial Since	2014
License received	2015
Variant Name	Semi

Current ADAS functionality – L2

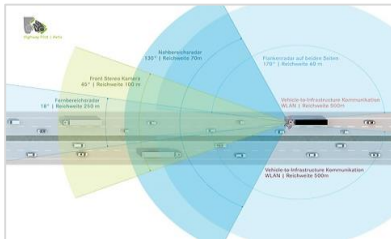
- [Active Drive Assist](#)
- [Lane Keeping Assist](#)
- [Detroit Assurance 5.0](#)
- [Platooning](#)

**List not exhaustive

Current Safety functionality – L2

- [Active brake assist 5](#)
- [Proximity Control Assist](#)
- [Sideguard assist](#)
- [Crosswind assist](#)

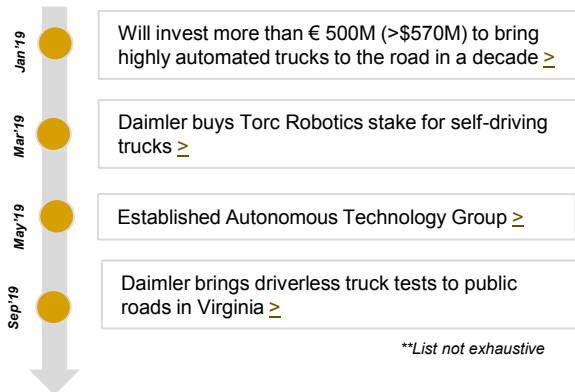
Sensor Suite >>



- 250m** – Long range radar
- 100m** – Stereo camera
- 70m** – Short range radar

**Details not exhaustive

Daimler's journey to L4 autonomous driving



**List not exhaustive

● = Strong Capability ○ = No capability

Press Release

Daimler rolls back autonomous taxi plan, focuses on trucks >>

Transport Topics

Future Plans - L4

[V2V communication](#)

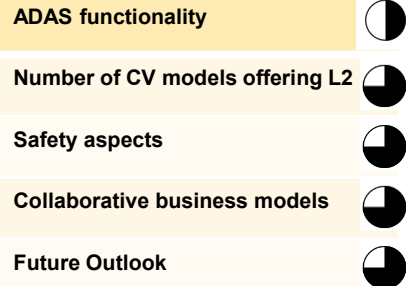
[Highway Pilot](#)

[V2I communication](#)

Ambitious Plans to roll-out Mercedes-Benz [Future Truck](#) 2025



FutureBridge Analysis



OEM activities in commercial vehicles (3/4) : Volkswagen

Traton Group has ambitious plans to roll-out L5 autonomous technologies by 2022 with plans of €1B in R&D by 2025

Source : [Traton Group](#)



Image: MAN Truck



Image: Scania Truck



Image: Caminhões Ônibus

Autonomous level

- L3 operation of autonomous truck in an Australian mine >>
- L4 Testing autonomous safety vehicles on the German Autobahn >>
- L5 By 2022 >>

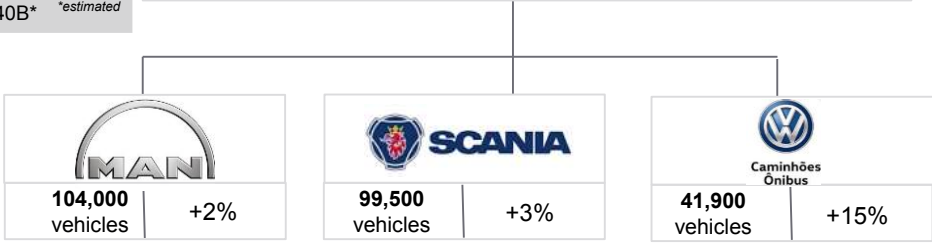
Commercial Vehicles

TRATON GROUP

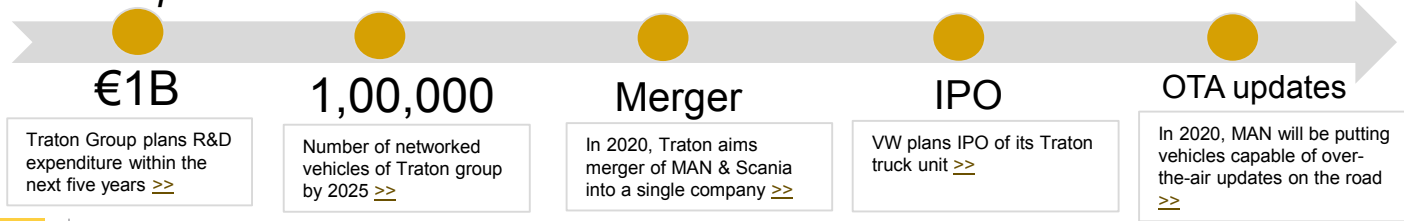
Production facilities	29
Brands	3
Countries served	17
Revenue by 2025	€40B* <i>estimated</i>

Commercial vehicle deliveries 2019 >>		
TRATON GROUP	242,000 vehicles	+ 4%

TRATON SE is a subsidiary of Volkswagen AG and a leading commercial vehicle manufacturer with its brands



Future plans



Press Release

Ford, VW signs agreements for joint ventures on commercial vehicles, autonomous driving >>

Collaborative business models

NAVISTAR VW Traton unit submits buyout offer for Navistar >>

Solera To develop smart & secure solution for transport logistics

ENVTCC To localize a MAN heavy-duty truck in China >>



FutureBridge Analysis

- ADAS functionality
- Number of CV models offering L2
- Safety aspects
- Collaborative business models
- Future Outlook

OEM activities in commercial vehicles (4/4) : Volvo

It is exploring autonomous solution in long distance transport, mining with its VADA 2.0 platform & has plans to add more AD functionalities



ADAS Availability



Image: Vera truck



Image: FMX truck



Image: VNL 670 model tractors

Press Release

Volvo Trucks electric and autonomous Vera gets its first job
The pilot program for Vera will take place in Gothenburg, Sweden >>>



Volvo Autonomous Solutions

Volvo Autonomous Solutions will constitute a new business area as of January 1, 2020. Its financial results will be reported as part of the Truck segment >>>

Current ADAS offering

*not exhaustive

Platooning

Forward collision warning

AEB

Lane departure warning

Highway departure warning

Active drive assist platform VADA 2.0

Different autonomous transport solutions

**List not exhaustive

2019



Vera will form part of an integrated solution to transport goods from a logistics center to a port terminal in Gothenburg, Sweden >>>

2019



Autonomous Volvo FH trucks will be used in commercial operation to transport limestone along 5 km stretch >>>

2018



In the Electric Site project, material handling in a quarry was automated and electrified. The result was a safer working environment and a reduction of operator costs by 40% and of CO2 emissions by 98 % >>>

*Future updates

ACC with Stop & Go

Lane change support

Collaborative business models

**List not exhaustive

2019



NVIDIA

To develop the decision making system of autonomous commercial vehicles & machines >>>

2018



NORSK MINERAL

To provide commercial autonomous solution transporting limestone from an open pit mine to a nearby port >>>

2018



FedEx

Used (ADAS) technology to conduct on-highway truck platooning as part of ongoing research collaboration >>>



FutureBridge Analysis

- ADAS functionality
- Number of CV models offering L2
- Safety aspects
- Collaborative business models
- Future Outlook



**List not exhaustive

02

Emerging player's activities in autonomous commercial vehicles

Upcoming Trend

- Players are inching towards L2 to L4 autonomous technologies and plan to offer highway pilot offerings in the near future, some are in the planning while others are in deployment stage
- Hydrogen powered autonomous trucks could gain traction and fuel the freight chain, as it is gaining interest from many OEMs and thus emerging players could provide breakthrough technologies
- Driverless commercial vehicles in closed geo-fenced areas is gaining interest. Plans in the future to scale up in open-highways

Players in our coverage



What do we see happening

- Focus on inching towards L4 from directly L2, currently few of them are offering platooning capabilities while others are planning to offer
- Players have ambitious plans to scale their autonomous freight network to multiple regions
- Roll-out of new electric and hydrogen powered autonomous trucks with region specific requirements
- Testing of driverless commercial vehicles in geo-fenced area, with no space for driver cabin

Summary of Emerging Players

Advancement from L2 to L4, robust sensor capabilities, collaborative business models will help to accelerate for higher autonomy

Parameters selected for competitive analysis



	EMBARK	tu simple	NIKOLA MOTOR COMPANY	einride
ADAS functionality	Offers Level 2 capabilities as of now	Offers Autonomous Freight Network allowing for L4 shipments	Offers 2 semi-autonomous variants Nikola Two in U.S & Nikola Tre in Europe	Capable of Level 4, the Einride Pod has no driver's cab, but can be remote controlled by a human operator
Sensor suite information	5 – Camera 3 – Radar 2 - LiDAR	<=200m LiDAR <=300m Radar <=1,000m HD Camera	Several HD cameras combined with radar, sonar, computing software & hardware to provide 360° views	5 – 77 Ghz Radar 1 – object & lane detection camera 4 – scanning LiDAR 4 – cameras for remote assistance
Collaborative business models				
Funding	\$117M as last reported in Sep'19	\$298M as last reported in Sep'19	\$462M as last reported in Sep'19	\$32M as last reported in Sep'19
Future Outlook	Plans to scale to Level 4 and offer ADAS functionalities like Highway Pilot	Have ambitious plans for expansion to 3 more regions in U.S by 2021 for autonomous deliveries	In 2021, to roll out of its Nikola Tre Class 8 truck. In 2023, launch of the Nikola Two Class 8 FCEV	Plans to roll-out full autonomous fleet by 2022-2023 in the U.S & EU

Emerging Player (1/4) : Embarc Trucks

Focus on inching towards L4 from directly L2, plans to offer highway pilot autonomous capabilities in the near future

Source : [Embarc Trucks](#)



Image: Embarc trucks



Founded	2016
Funding*	\$117M <small>*Funding details as on Sep'19</small>
Fleet size	13 trucks <small>*Numbers by 2019 end</small>
Test miles	2,400+ <small>*Indicated in 2018</small>



L2

L4

ADAS offering
<ul style="list-style-type: none"> Adaptive Cruise Control Automatic emergency braking Blind spot detection Lane Keep assist Intelligent park assist Platooning <small>*offered as of now</small>
<ul style="list-style-type: none"> Traffic Jam assist Highway Pilot <small>*planned for future with no release date</small>

Embarc is building self-driving truck technology to make roads safer and transportation more efficient >>



Embarc Trucks completed a coast-to-coast test drive of its self-driving semis



Collaborative Partners**



Embarc integrates its self-driving systems into Peterbilt semis, rather than building its own vehicles completely from scratch >>



Amazon is using self-driving trucks developed by Embarc to haul some cargo on the I-10 interstate highway >>

**Collaborative partners list not exhaustive

Sensor Suite >>

- 5 Camera
- 3 Radar
- 2 LiDAR



FutureBridge Analysis

ADAS functionality	
Sensor suite information	
Collaborative business models	
Funding	
Future Outlook	

Emerging Player (2/4) : TuSimple

It has ambitious plans to scale to three more regions in the U.S and widen its L4 autonomous freight network by 2021

Source : [TuSimple](#)



Image: TuSimple trucks



TuSimple's Autonomous Freight Network allowing for L4 autonomous shipments

Currently operating in Phoenix, Tucson, El Paso

Future plans of expansion

San Antonio	2021
Houston	2021
Dallas	2021

Collaborative Partners**

**list not exhaustive

5 Mar'20
26 Mar'20



TuSimple expands autonomous trucking program with UPS >>>



TuSimple, ZF partner to develop and produce autonomous truck technologies >>>



tu simple
UC San Diego

University of California San Diego study in its findings showed that autonomous trucks operated by self-driving startup TuSimple reduce fuel consumption of heavy-duty trucks by at least **10%** and up to **20%** >>>

\$298M

Total Funding Amount received
As on Sept, 2019



FutureBridge Analysis

ADAS functionality



Sensor suite information



Collaborative business models



Funding



Future Outlook



Current fleet	40 >>>	As on Mar, 2020
Contracted customers	18	As on Mar, 2020
Autonomous trip each week	20	As on Mar, 2020

Sensor Suite >>>

- <=200m LiDAR
- <=300m Radar
- <=1,000m HD Camera



= Strong Capability



= No capability

Emerging Player (3/4) : Nikola Motors

Ambitious plans to roll-out new electric & hydrogen powered autonomous trucks by 2021- 2023 with region-specific requirements

Source : [Nikola Motors](#)



Image: Nikola trucks

Nikola offers both pure electric and also hydrogen electric powertrains to cover class 8 in transportation

Future Plans >>

2021

The company expects to generate revenue with the roll out of its Nikola Tre Class 8 truck

2023

Launch of the Nikola Two Class 8 FCEV (fuel cell EV)



Nikola has nearly **\$14 billion** in pre-orders, which give some insights into how big the market for hydrogen-powered and electric trucks can become

ADAS Availability



The fully-electric and hydrogen fuel cell electric day cab semi-truck. Available in North America >>



The fully-electric and hydrogen fuel cell electric cabover semi-truck. Available in Europe and North America >>

Electric battery heavy trucks

Upto 300 miles >>

Hydrogen fuel cell trucks

Upto 750 miles

Orders for FCEV semi-trucks

14,000 +

Refilling hydrogen powered trucks

20 minutes

Sensor Suite >>

Several HD cameras combined with radar, sonar, computing software & hardware to provide 360° views

Collaborative business model



CNH Industrial brands Iveco & FPT together with Nikola announce Nikola Tre production in ULM, Germany >>

***List not exhaustive

Press Release

Can Electric Truck Company Nikola Become the Next Tesla After Going Public?

Phoenix-based Nikola goes public, possibly worth \$11 billion or more >>



Total Funding Amount



\$ 462M

As on Sept, 2019



FutureBridge Analysis

ADAS functionality

Sensor suite information

Collaborative business models

Funding

Future Outlook

Emerging Player (4/4) : Einride

Capable of L4, without no space for the driver on the board and has ambitious plans to offer full self-driving by 2022-2023

Source : [Einride](#)



Image: Enride trucks

Capable of Level 4 self-driving, the Einride Pod has no driver's cab, but can be remote controlled by a human operator >>

By **2022 - 2023**

Full autonomous fleets operating in EU & the U.S

200 [Fleet Size](#)

124 [Miles](#) it can travel autonomously with Nvidia Drive AI platform

**Collaborative partners list not exhaustive

Collaborative business model



**Collaborative partners list not exhaustive

ADAS Availability



Image: Enride Pod



In 2019, the Pod became one of the first all-electric, self-driving transport vehicle to operate on a public road in Sweden. There is no space for the driver on the board >>

Press Release

"A new type of vehicle being tested by Swedish start-up Einride and it could soon disrupt the transportation industry" >>

The Washington Post

\$32M

Total Funding Amount received

As on [Oct, 2019](#)



FutureBridge Analysis

ADAS functionality

Sensor suite information

Collaborative business models

Funding

Future Outlook

Technical Specification

Loading capacity	15-18 pallets
Range per charge	130 – 180 km
Gross vehicle weight	26 tonnes
Payload	16 tonnes
Automated Charging	Yes

Sensor Suite >>

- 5** 77 Ghz radar sensors
- 1** Object and lane detection camera
- 4** Scanning LiDAR sensors
- 4** Separate cameras for remote operator assistance

03

Regulation impacting commercial vehicles

Upcoming Trend

- Rise of zero-emission commercial vehicles and autonomous driving could accelerate the state's role in trucking technology development
- Multi-brand platooning with communication with infrastructure and other road users should be possible to drive across Europe on motorways

Regions in our coverage



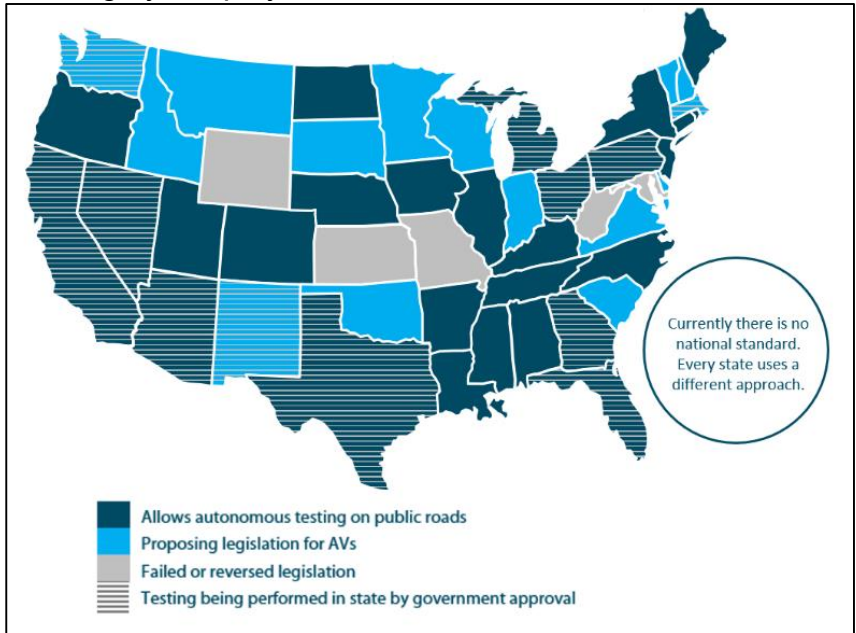
What do we see happening

- Currently, no federal standard on autonomous trucking technology exists in the U.S, so every state varies in its acceptance of autonomous trucking technology
- California is becoming as preferred choice for the players for testing and developing higher automated driving technology for heavy-duty trucks
- EU is developing platooning technology and relevant standards for multi-brand platooning

National Standards for Autonomous Trucking in the U.S



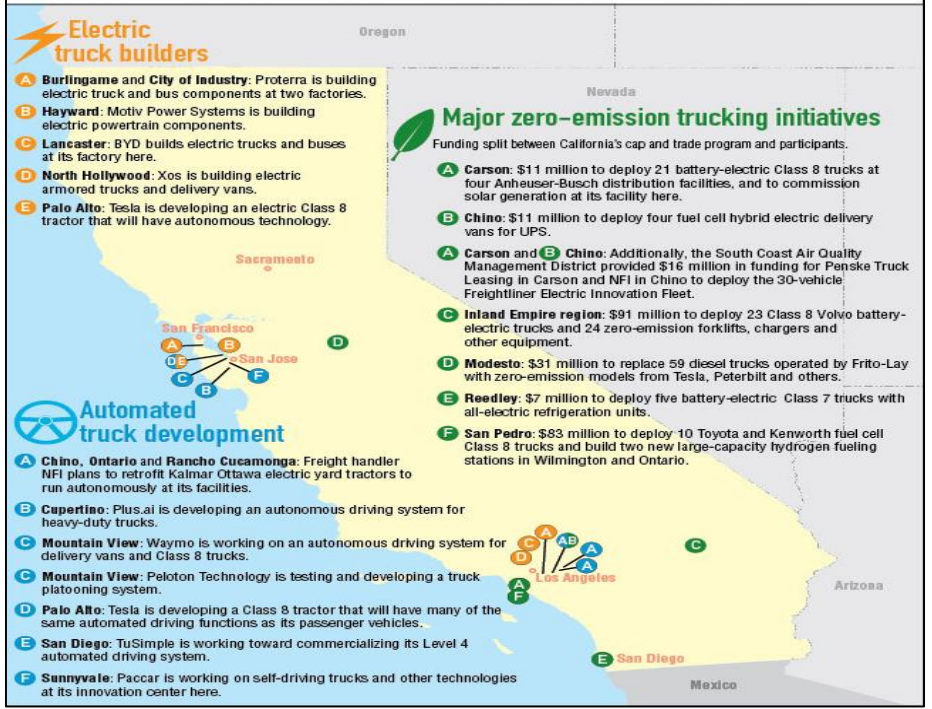
Every state in the U.S follows different approach for autonomous trucking, while California has become the preferred choice of testing by the players



- Currently, no federal standard on autonomous trucking technology exists in the U.S, so every state varies in its acceptance of autonomous trucking technology
- Several states have no proposed legislation, meanwhile states like Nevada, California, Texas, and Arizona are hotbeds for testing automated trucks

California Becomes Epicenter of Emerging Truck Technology

Electric and Automated Trucks in California

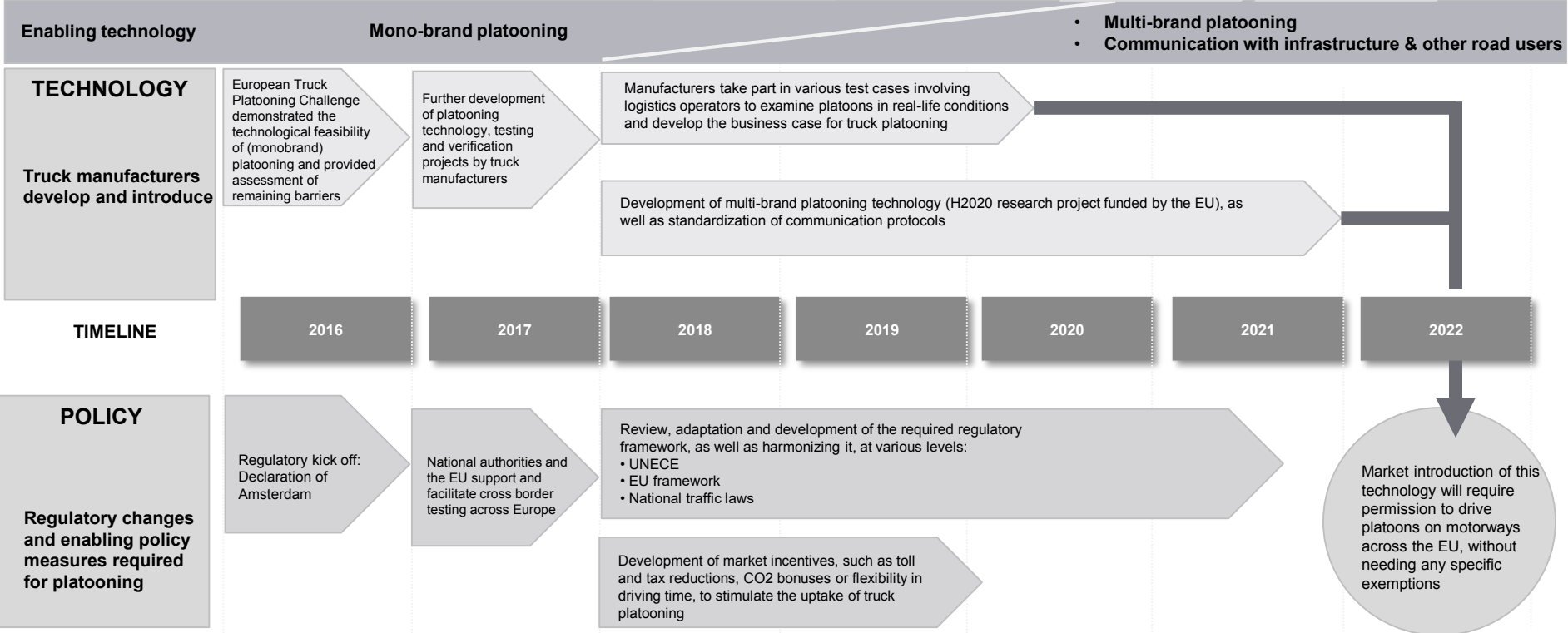


EU Roadmap for Truck Platooning



This roadmap provides an overview of the steps that are necessary to implement multi-brand platooning (up to SAE level 2) before 2025

Platooning Step-By-Step Introduction



04

Future outlook in commercial vehicles

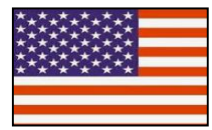


Upcoming Trend

- Significant rise in capacity of freight loads is expected by 2028, which will further accelerate the need of automation in the trucking industry
- Need for clean, power efficient freight technologies is gaining interest among the players
- Advancements in ADAS functionalities like automated steering function can be a possibility
- Adoption of standard legal and insurance framework will help to accelerate the testing and faster commercialization of autonomous trucks



Regions in our coverage

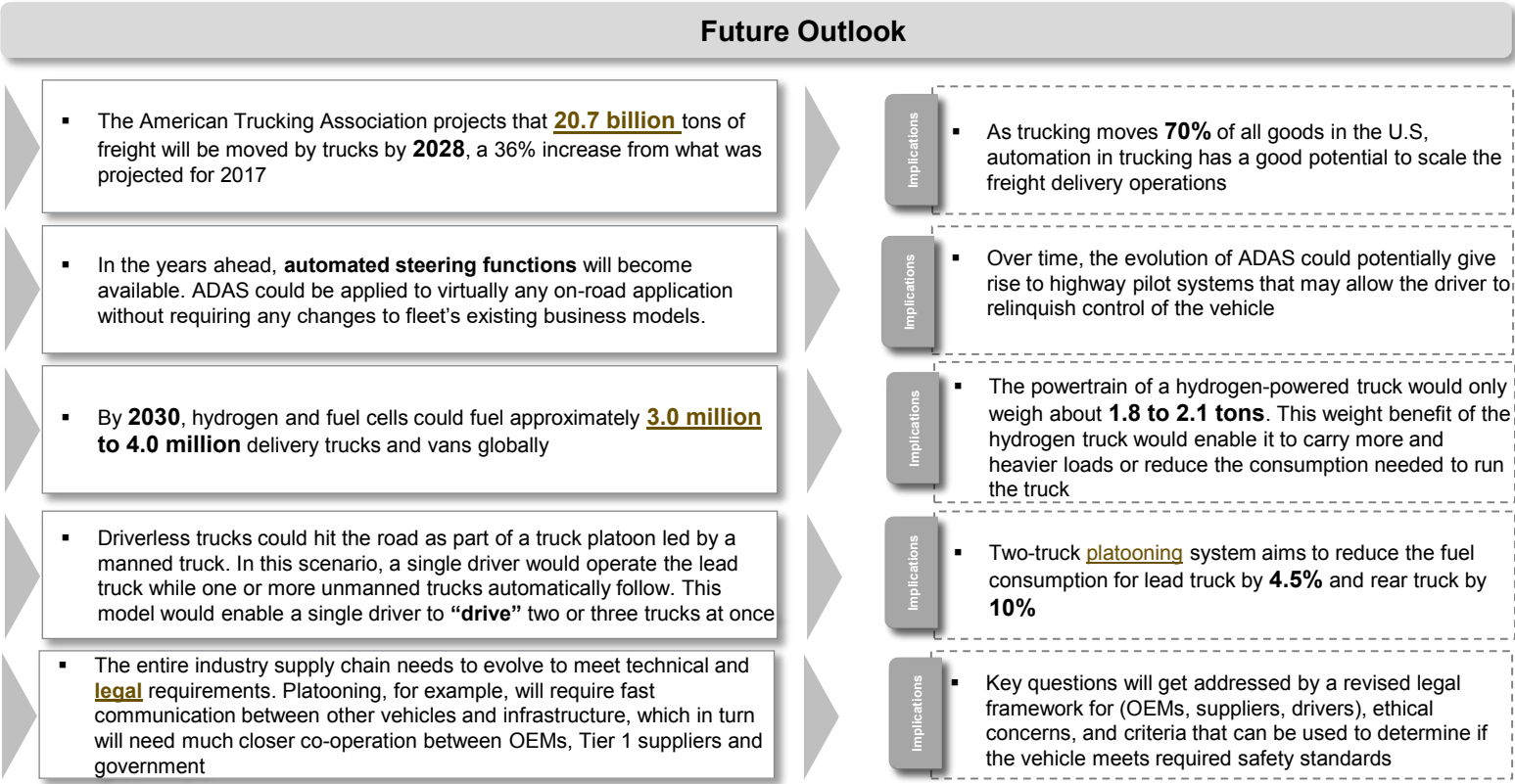


What do we see happening

- Trucking moves close to 70% of all goods in the U.S, regions in U.S like California are becoming the epicenter for autonomous trucking technology
- The latest safety systems for commercial trucks already provide collision mitigation, adaptive cruise control and lane-departure warnings. In the years ahead, automated steering functions also will become available
- Trials of two-truck platooning system is on rise which aims to reduce significant fuel consumption

Future Outlook: Activities in autonomous commercial vehicle segment

With increased capacity in freight loads, focus will be on safety along with power efficient technologies which will ride next generation of platooning



»» Other deliverables to read

H1'20 ExL & TDD - ADAS

This is a semi-annual coverage of industry activities....stay tuned...releasing last week of July

What's inside?

1. Emerging trends in the autonomous driving area for last 6 months
2. Competition assessment & breakthrough technologies for cruise, park, and safety features
3. What self-driving cars are doing in midst of Covid-19 & its post-pandemic impact
4. Regulation governing the AD and ambitious plans of players to roll-out full self-driving capabilities

June 2020 – ADAS Bulletin >>

What's inside ?

- Key activities in collaborative business models to accelerate Level 4 automated driving
- Release of AV TEST program by NHTSA to bring transparency to autonomous vehicle testing
- IIHS study stating self-driving vehicles could struggle to eliminate most crashes

»» Do you want to learn more?

Submit a Business Objective >>

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