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McKinsey Center for Future Mobility

McKinsey perspective on shared autonomous driving

Ruter dialogue conference

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The McKinsey Center for Future Mobility



Deep expertise on all mobility related topics

~2,000

hours per day spent on future mobility related topics



Integrated, cross-industry perspective

360°

perspective on mobility, covering all industries and institutions in the mobility ecosystem



Network of world class thought leaders

>200

future mobility experts in McKinsey and industry across the globe



Market leader for mobility projections

>35

dedicated colleagues working exclusively on mobility projections



Voice of the industry

>100

publications in the last 3 years, based on proprietary research

McKinsey view on shared AVs

Globally accepted industry consensus

Private vehicles are a pain point in most large cities

Already today, private vehicles cause significant congestion and emissions, further growth in line with GDP and urbanization expected to lead to gridlock

Governments and cities open towards shared mobility

Regulatory initiatives support shared (autonomous) mobility developments

Investment landscape heavily benefits development of AV tech

Over 300 billion USD invested into shared and autonomous technologies/companies

Shared AVs has tremendous disruption potential

Adoption of shared AVs likely through 2030+ in major cities

Additional facts supported by McKinsey data/insights

Consumers likely adopt the new technologies quickly

Global consumers state willingness to trade in their car for autonomous shared mobility

Shared AV costs will see rapid decline

Cost/km for shared AVs may go down to 1/3 of private vehicle ownership cost by 2035+ - break-even expected significantly before 2030

Shared AVs as suitable option to solve cities' mobility pain points

Shared AVs combine the convenience and time benefit of individual vehicles with the space consumption of public transport – and are 100% locally emission free

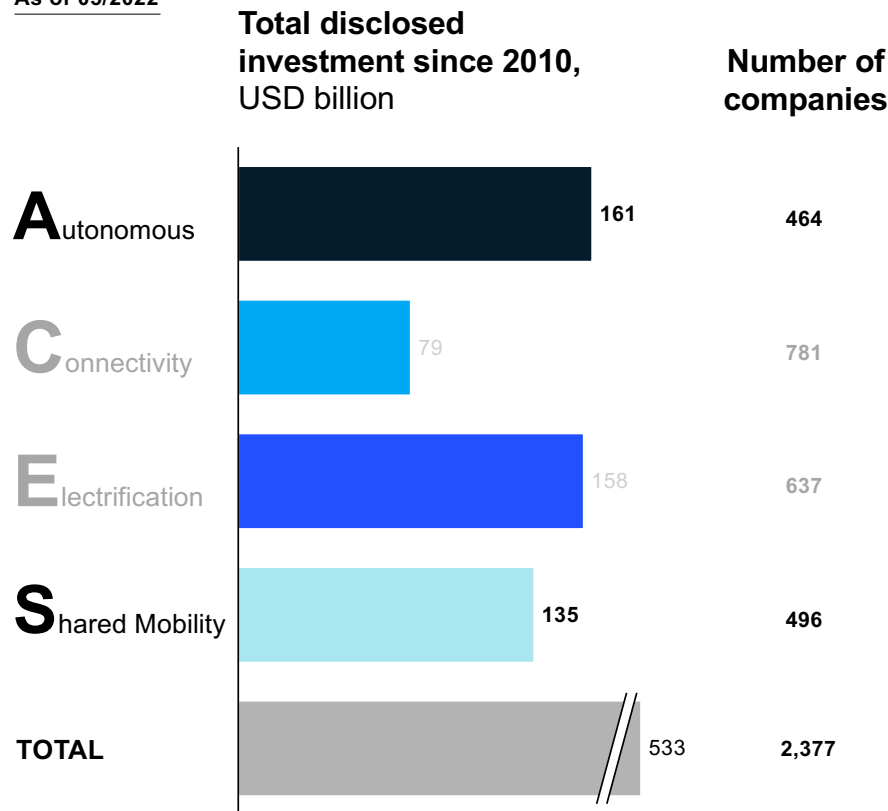
Challenges to be addressed

Operational challenges

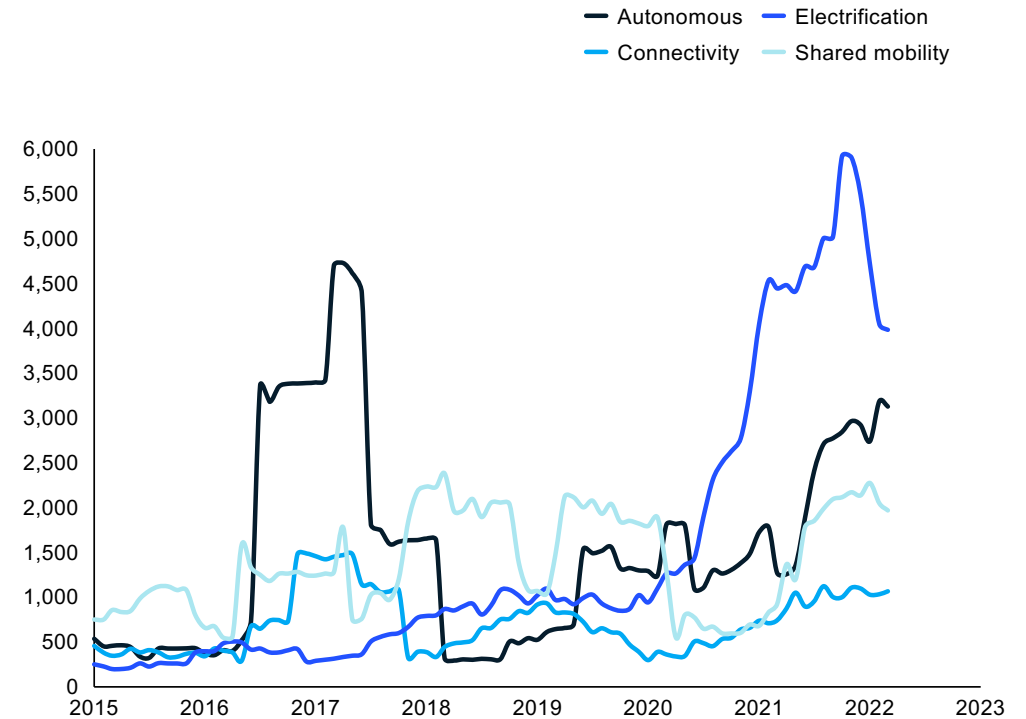
Shared AVs rollout pace likely in-between that of (asset-free) ride-hailing and (asset-heavy) car sharing due to city specific adaptation of maps/tech stack and sizable investment into vehicle fleets

Investments into autonomous driving showed a peak in 2016 and 2017 but are now increasing again

As of 05/2022



12-month rolling average of disclosed investment amount, USD million



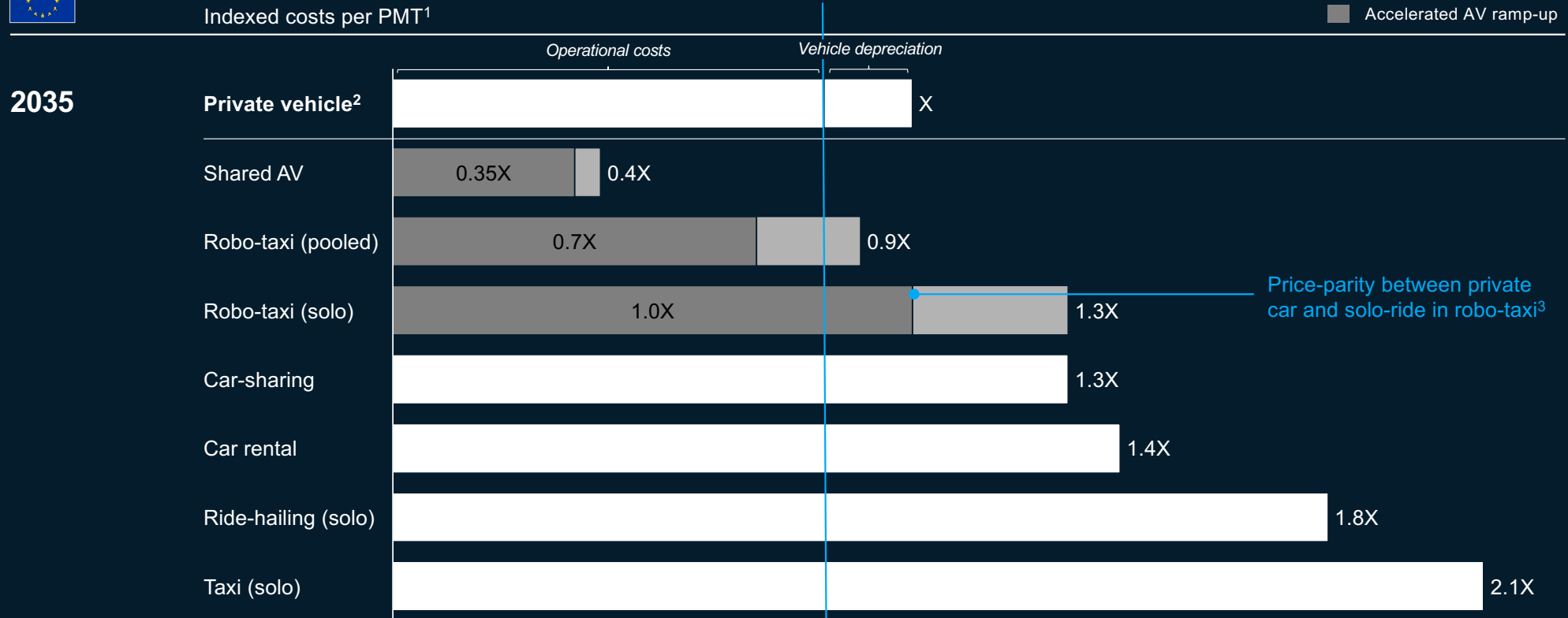
Shared autonomous vehicles could become a real alternative to private car usage costs by 2035+

Cost per PMT comparison per mode – EU 2035+



Price-parity between using an owned private car and MaaS³

Expected AV ramp-up
Accelerated AV ramp-up



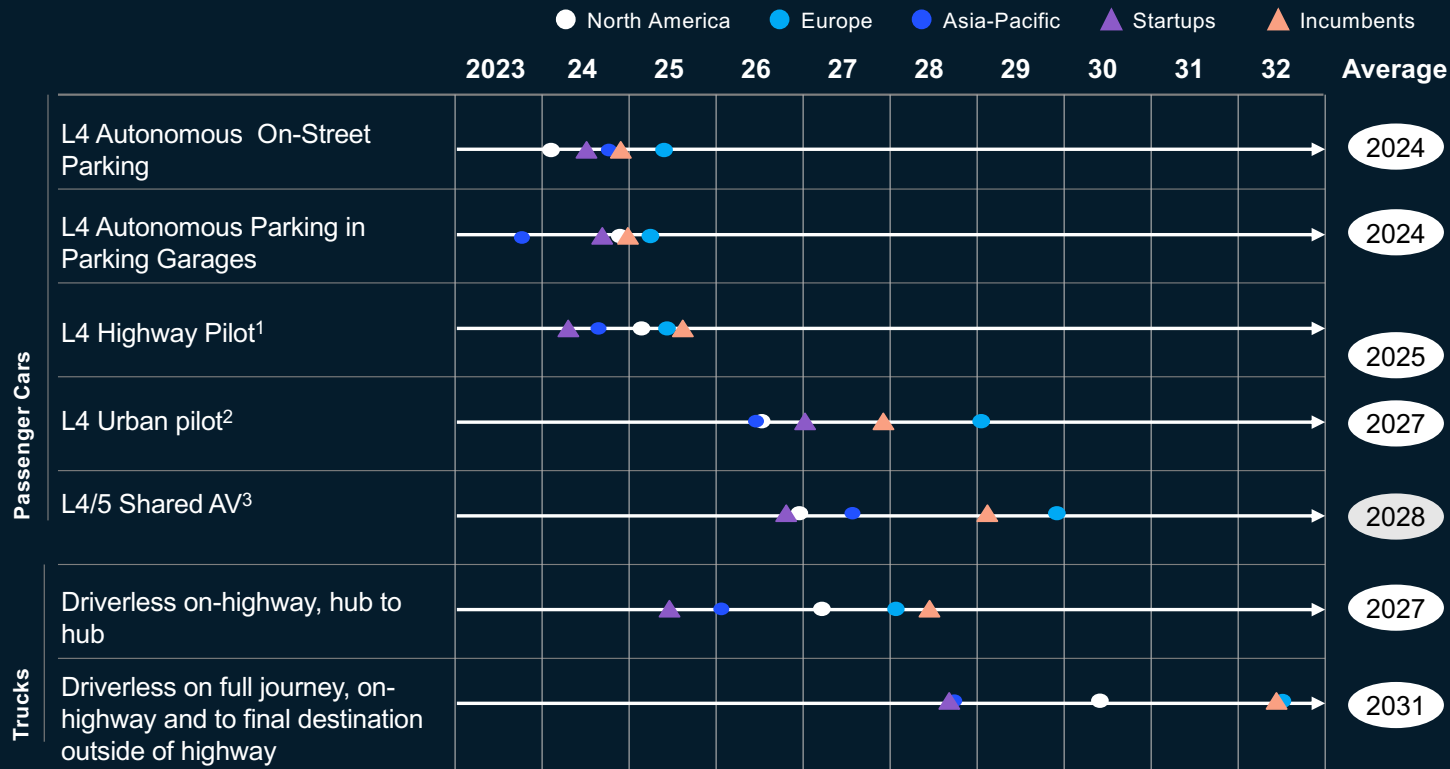
1. For shared modes end-customer price per PMT and for private vehicle MSRP share per year and operational costs (e.g. maintenance, insurance, charging, cleaning, parking, tolling, financing,...)

2. Assumed MSRP of USD 34,360 and lifetime-mileage of 197,106 miles

3. Assumes a 28% profit margin for solo-rides in robo-taxis; **price-parity with using an already owned private vehicle could be reached with 10% profit margin**

Experts expect L4 use cases to emerge by 2024+ but lagging behind in Europe

Timeline



1. Driver can use the time on highways for work or leisure activities using in-car or own solutions – need to take over at highway exits ; 2. Driver can use the time on highways in urban environments for work or leisure activities using in-car or own solutions – there might be certain situations, where the driver needs to take over; 3. Robotaxis are driving everywhere in fully automated mode with no driver and are accepting and conducting transportation requests (goods, passengers). Passenger can use the travel time for work or leisure activities

Question: In your estimation, what is the rollout (i.e., commercial availability of vehicles/ service) timeline for autonomous driving across use cases in your region?

Source: 75 respondents (31 from NA, 33 from EU, 11 from APAC)

Key takeaways

- Earliest use cases include L4 parking and highway pilots with urban pilots following 2-3 years later
- Startups are more bullish especially on advanced AV rollout by 2-3 years

China and US with expected strongest uptake in autonomous shared mobility through 2035+ without additional stimulation

Autonomous mobility market development per region




■ Shared mobility w/ Driver² ■ Shared AV

(X) Autonomous share of shared mobility PMT (in %)

(X) Total shared AV revenues (in Bn USD)

Regional shifts in total PMT and related revenue pools

in billion miles and billion USD, Reference scenario

				Revenues		Cities leading the uptake 2035 reference scenario	
Europe¹ 	2019		(<1)	(~0)	London	Berlin	
	2030		(<5)	(<5)	Paris	Rome	
	2035		(~35)	(~55)	Barcelona	Madrid	
United States 	2019		(<1)	(~0)	New York	Washington D.C.	
	2030		(~30)	(~45)	Los Angeles	Boston	
	2035		(~50)	(~235)	Chicago	Houston	
Greater China 	2019		(<1)	(~0)	Shanghai	Tianjin	
	2030		(~5)	(~5)	Beijing	Guangzhou	
	2035		(~45)	(~105)	Chongqing	Nanjing	

1. Incl. European Union, United Kingdom, Switzerland, Iceland, Norway

2. Shared mobility w/ Driver includes ride-hail, taxi, and pooled shuttle

What makes McKinsey distinctive in autonomous driving



Close and intense working relationship with all ecosystem players along the future shared AV value chain



Proprietary research, publications, cooperation, and data on the future of mobility and AV industry



Ready to-use tools, proprietary models and database to simulate the future of mobility and AV in special

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McKinsey Center for Future Mobility (MCFM) as dedicated think tank for the future of mobility and disruptions in the automotive and mobility industry

Typical questions around AV we help our clients with

Tech and auto players: Where are future profit pools and control points along the value chain? How to position as tech player in the ecosystem – what to do inhouse and where to partner?

Public transit operators: What are the economics of shared AVs and how does this compare to today's mobility modes? How can a PT authority help to accelerate shared AV adoption? Who are leading (tech) players to partner with?

Cities: What is necessary to implement shared AVs in future city environments? How does the ecosystem look like and which players does a city have to assemble?

Financial Investors: What is the current industry and expert consensus on AVs? What are different scenarios and main drivers of future AV development? How big is the shared AV opportunity by geography, over time, etc.?

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