Electrification of fleet operations

March, **2024**

pwc

Table of contents

Executive summary

Executive Summary

Transportation is an integral part of our daily lives, but is also a major contributor to global carbon emissions. Now, as the world grapples with climate change, the transportation sector is taking significant steps to reduce CO_2 emissions worldwide. Electric Vehicles (EVs), powered by renewable energy sources, offer a sustainable alternative that can help us move towards a greener future. This report emphasises the critical need for electrification and decarbonisation in the Mobility as a Service (MaaS) industry, highlighting the transition towards electric mobility (e-mobility) for MaaS fleets.

It also details the adoption of cleaner technologies, the economic benefits of switching to EVs, and the competitive strategies necessary for achieving industry leadership in this evolving landscape.

As demonstrated in our five-year total cost of ownership (TCO) analysis in the sections below, the environmental and economic benefits of EVs are the primary drivers of electrification. Despite the higher initial costs, EVs offer significant operational savings over time compared to fossil fuel-based vehicles.

Industry pioneers like DiDi (China), Lyft (US), and Uber (US) are rapidly advancing towards electric and autonomous fleets around the world, establishing new standards for the industry. Similarly, BluSmart (India) and Waymo (US) have gained a first-mover advantage by entering the ride-hailing market in India and the US respectively with pure-electric fleets.

Furthermore, investments in charging infrastructure are essential for supporting this transition and open up opportunities for new revenue streams, aligning business growth with sustainability commitments.

Key insights include:

Transportation emissions

Road transport accounts for around 21% of global CO_2 emissions. As more and more people around the world opt for fleet services instead of personal vehicles, the transition of fleet aggregators from fossil fuel vehicles to EVs plays a crucial role in the decarbonisation of the transportation sector.

Four pillars for electrification of fleets

Successful electric fleet adoption relies on four critical elements: supportive government policies, comprehensive charging infrastructure, an adaptive supply chain that meets supply and demand, and the digital enablement of services.

Financial favorability of EVs

The high initial costs of EVs are offset by their lower operational expenses over time, leading to an overall cost advantage compared to internal combustion engine (ICE) vehicles. This advantage is not only observed in regions where EV subsidies are provided, such as the EU, US, and China, but also in non-subsidised regions like the Middle East, where the cost of owning an electric vehicle has become equivalent to that of ICE vehicles.

Business models adaptation

Adaptability is crucial in the business landscape. Fleet operators are increasingly adopting versatile models, including investments in fleet companies and the introduction of 'charging-as-a-service' to enhance revenue and operational efficiency. Simultaneously, many original equipment manufacturers (OEMs) are developing their own electric and autonomous fleets. This move does not only demonstrate their capabilities in fleet aggregation but also showcases their technological prowess.

Strategic industry evolution

The period from 2020 to 2023 marked a strategic inflexion point, characterised by large fleet operators committing to EV transitions and innovators enhancing the infrastructure through intelligent, integrated platform capabilities.

Introduction

Introduction

Rising sea levels, extreme weather conditions, and the deterioration of biodiversity quality emphasise the urgent need to mitigate carbon emissions and address the spiralling consequences of global warming.

Global CO_2 emissions increased by **~2%** from **2021 to 2022**, reaching **38.5** gigatons of carbon dioxide ($GtCO_2$). (source)

While many sectors contribute to the overall carbon footprint, transportation plays a significant role. In 2022, major countries such as the US, China, and India were at the forefront of transportation emissions, collectively releasing almost 3 billion tonnes of carbon dioxide equivalent ($BtCO_2$/yr).

Additionally, the Middle East saw transportation sector emissions reach 225 $MtCO_2$/yr.

Figure 1. Global CO_2 emissions share by sector (2022)

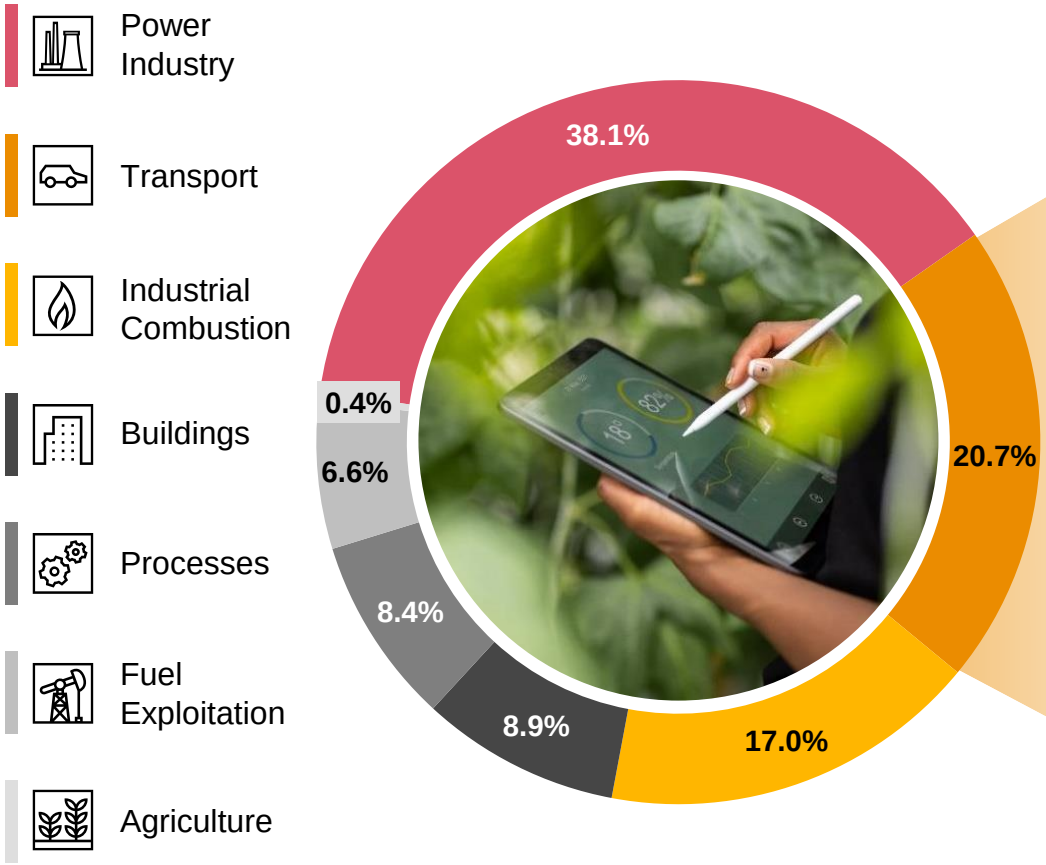
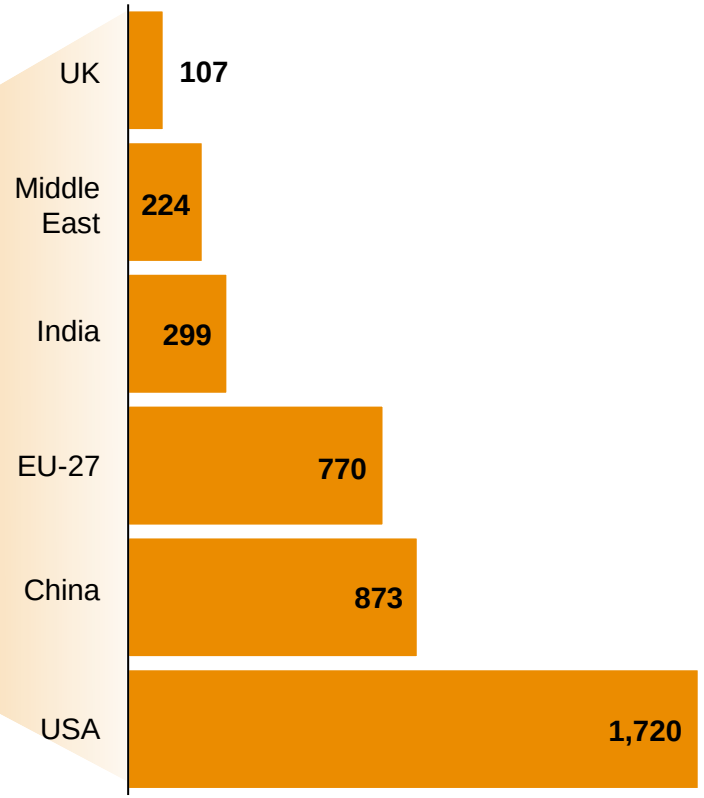


Figure 2. CO_2 emissions in transport by country (Mt CO_2)



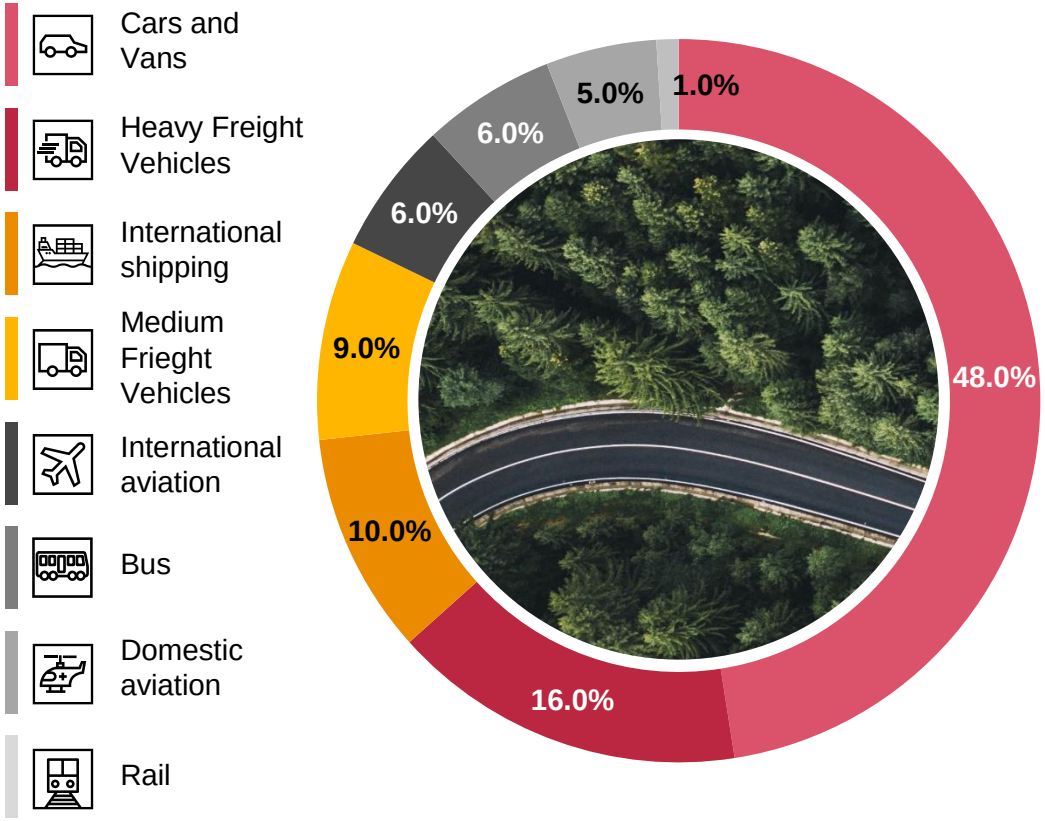
Source: European Commission and IEA

Introduction

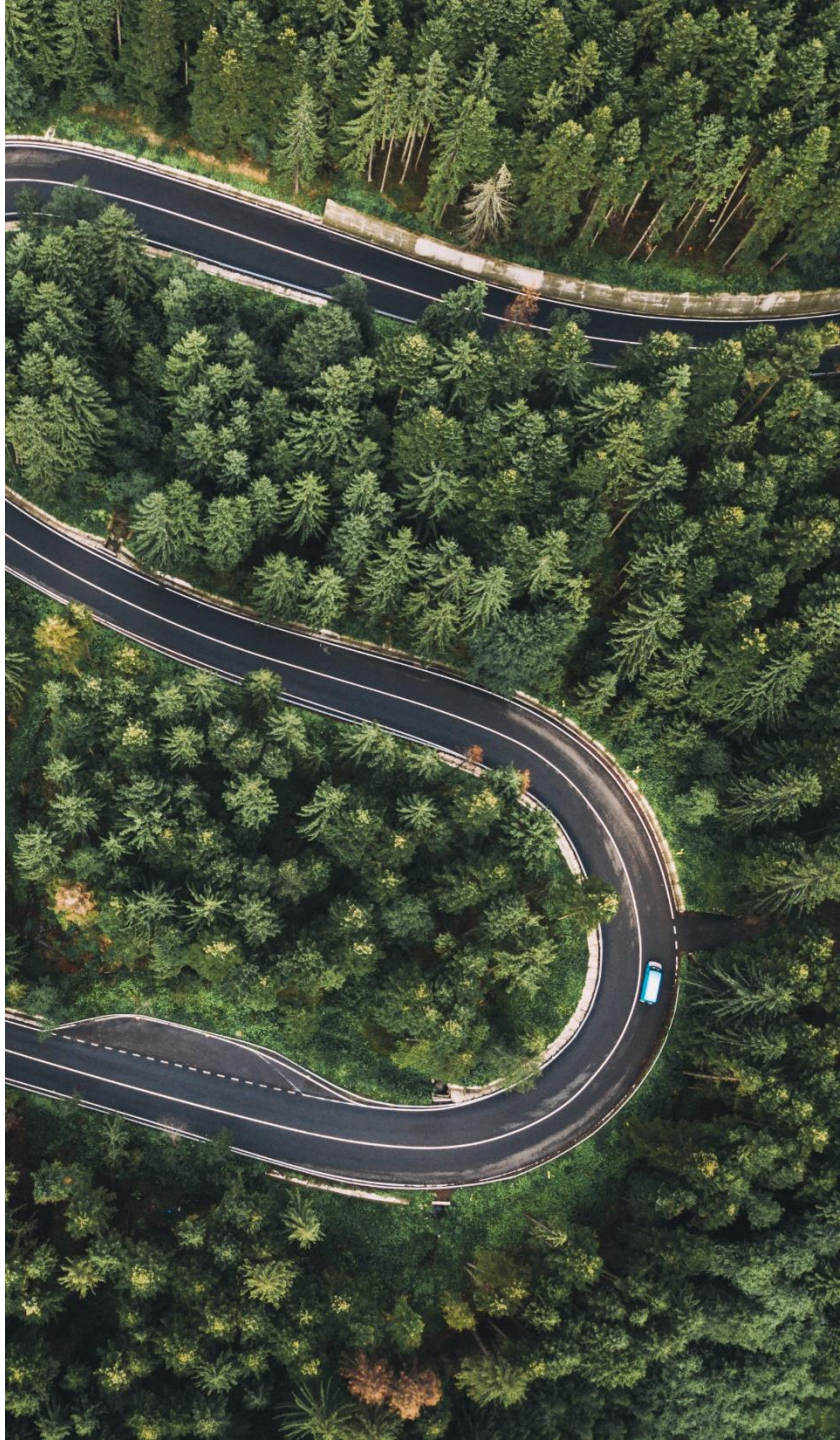
Cars and vans generate the largest share of carbon emissions within the transportation sector, underscoring the push for sustainable mobility.

The sustainability of the transportation sector is critical in achieving net-zero emissions. The adverse impacts on health and significant contribution to global warming from fossil fuel-based mobility highlight the urgency for nations to transition swiftly. Although countries are at different stages of their decarbonisation journey, electrification of the fleet, which includes ride-hailing, ride-pooling, and ridesharing, is emerging as a solution.

Figure 3. Global CO_2 emissions share in the transport sector by transport type (2022)



Source: European Commission and IEA

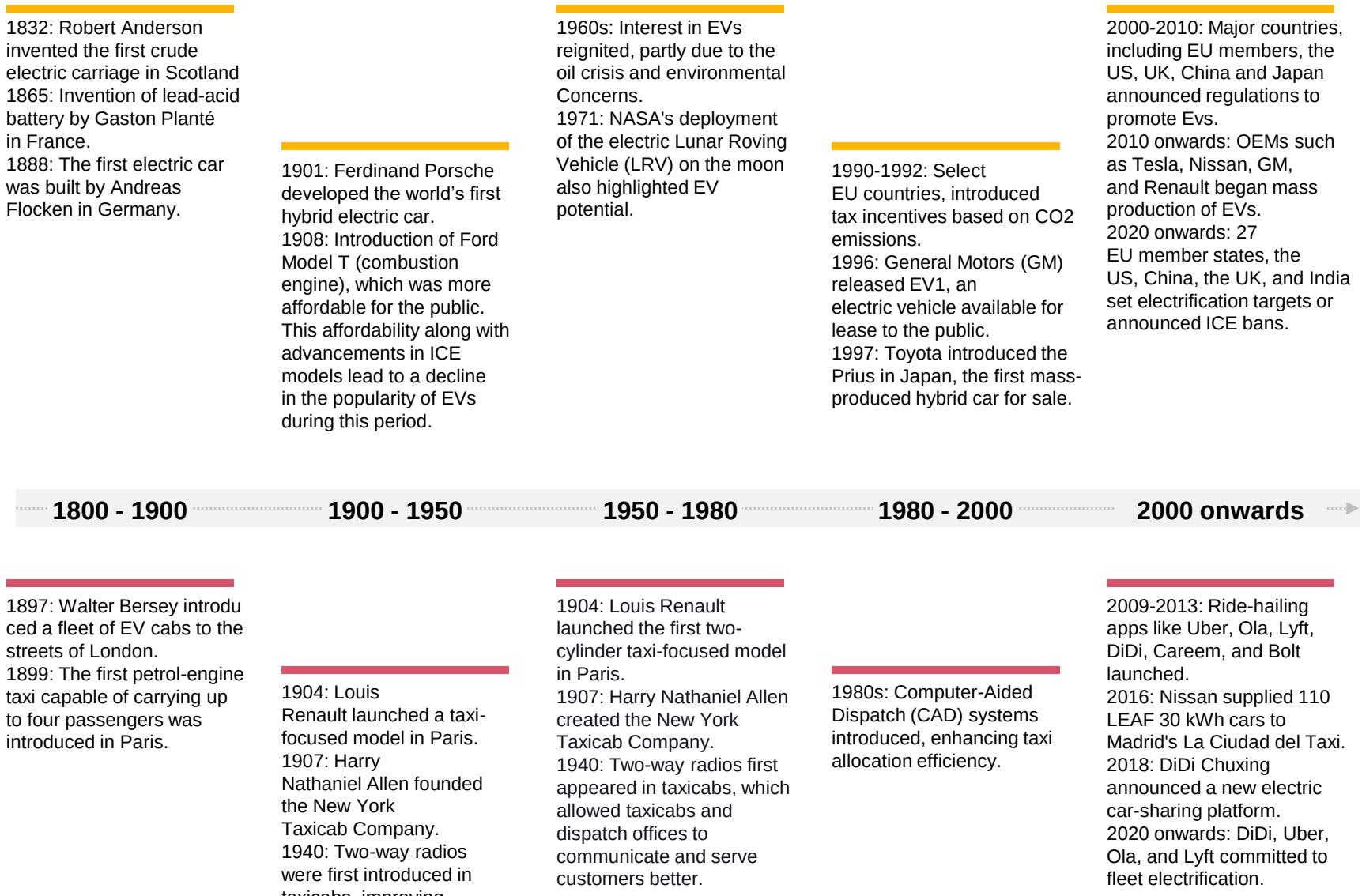


Electric mobility timeline

The timeline below traces the development of EVs and its evolution from the early days of MaaS to its electrified future.

Between 2000 and 2020, in response to environmental concerns, governments worldwide enacted regulations to promote EVs, aligning with the 2015 Paris Agreement. Initiatives such as purchase subsidies, tax credits, electrification targets, and efforts to develop the EV charging infrastructure encouraged automakers to accelerate sustainable transportation solutions. As vehicle technologies improved, the fleet service industry also transformed, transitioning from traditional models to taxi fleet aggregation and digitalised services.

The emergence of companies like Uber (USA), DiDi (China), Ola (India), and Lyft (USA) in the early 2010s marked a paradigm shift, introducing app-based ride-booking services that streamlined mobility operations and enhanced user experiences by offering efficient and convenient fleet services.



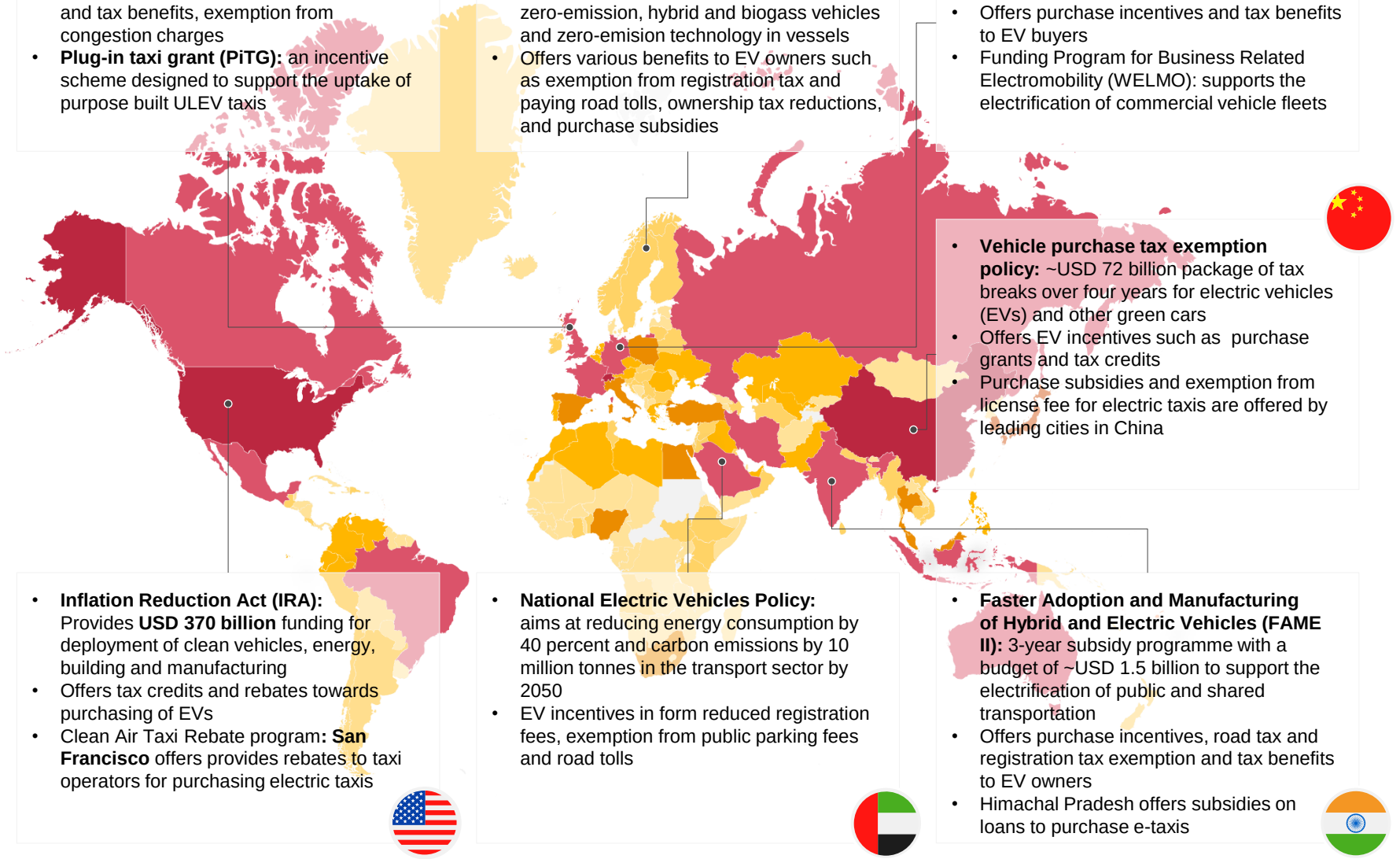
Global heatmap on CO_2 emissions from the transport sector

This global heat map illustrates the carbon emissions (CO_2), generated by the transportation sector in 2022. It clearly shows that in nations such as the USA, Canada, UK, China, India, Germany, and the Netherlands, among others, the transportation sector has been one of top carbon emitting sectors.

As carbon emission reduction has become a top priority for nations, they are taking initiatives to reduce CO_2 emissions from the transport sector. These include formulation of regulations and policies, and offering financial incentives, and tax benefits to encourage the widespread adoption of EVs.

In addition to this, some countries are actively encouraging fleet electrification with enticing incentives. After recognising the potential impact of CO_2 emissions on the environment from taxi fleets, governments are offering purchase incentives and tax credits to taxi operators and aggregators to transition to EVs.

Source: European Commission , IEA, and Government websites



The charge towards net-zero: Electric vehicles leading the way

Transitioning to an electric fleet not only brings economic benefits but also provides a great opportunity for businesses to showcase their commitment to sustainability.

By switching rides booked via mobility platforms to electric, we can significantly reduce CO_2 emissions, resulting in significant environmental transformation. As cities expand, integrating EV technology with shared mobility platforms has become increasingly crucial.

Electrifying fleet services goes beyond curbing emissions; it opens the door to a holistic green energy ecosystem that includes advanced charging infrastructure powered by renewable sources.

The seamless execution of electrified fleets relies heavily on four cornerstones: Favourable governmental frameworks, robust charging networks, a resilient market-responsive supply chain, and digital enablement.

The detailed insights on these are in the following graphics:

Enabling government policies and regulations

Governments around the world are implementing policies and regulations to support the development of an e-mobility service ecosystem that is environmentally sustainable and economically viable. These initiatives encourage manufacturers and investors to enter the market with their EVs and its infrastructure solutions, setting the stage for a wider adoption of e-mobility.

Charging infrastructure

It is vital to establish an efficient charging infrastructure that incorporates renewable energy to achieve zero well-to-wheel emissions and ensure eco-friendly EV operations.

Market fit products and services

Streamlining the supply chain to continuously develop products and services that meet the market demands is imperative for increasing the adoption of EVs and EV infrastructure services. This approach is essential not only for boosting EV uptake but also for unlocking and enhancing revenue opportunities.

Digital enablement in fleet electrification

The successful electrification of fleets requires the integration of advanced technologies, such as telematics, connectivity, battery health monitoring, and integrated mapping systems. These systems are essential for efficient route planning, locating EV chargers and comprehensive fleet management to ensure smooth operations for fleet operators. Additionally, the digital app services that allow customers to locate, reserve and pay for electric taxis can significantly enhance the customer experience.

A new business opportunity

A new business opportunity

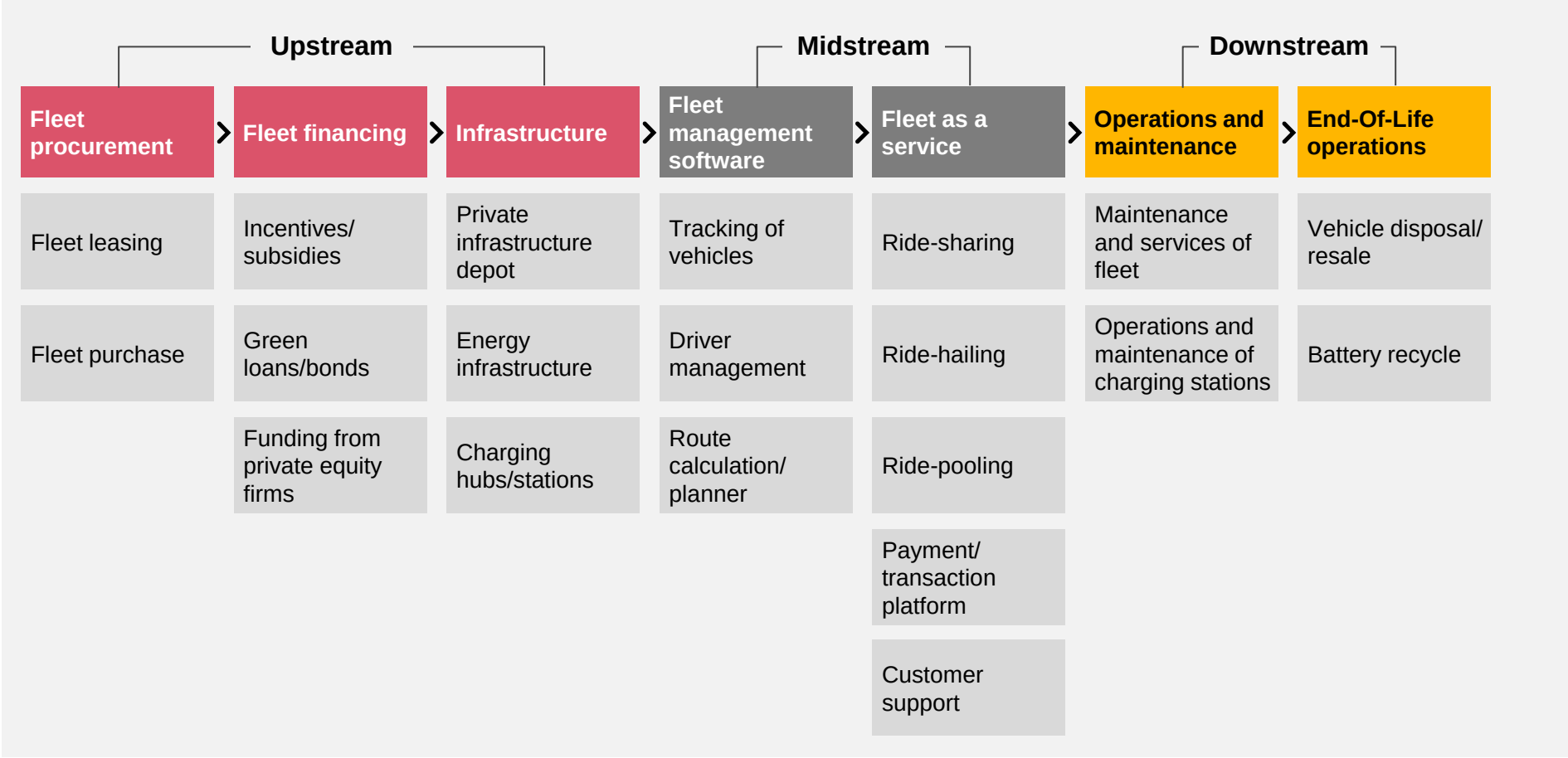
Electrification of fleets is triggering new revenue-generating opportunities across the e-mobility value chain, as numerous MaaS operators are implementing electrification strategies to minimise their environmental impact.

For example, DiDi aims to incorporate 10 million electric vehicles into its fleet by 2028. Lyft plans to transition its entire fleet to electric vehicles by 2030. Similarly, Uber is working towards zero-emission mobility in regions, such as the US, Canada, and European cities, by 2030, with an overarching goal of achieving net-zero emissions company-wide by 2040.

Alongside these industry giants, specialised electric fleet providers like BluSmart are emerging, demonstrating innovative possibilities within the e-mobility sector.

This section will explore the fleet electrification value chain, including its upstream, midstream, and downstream aspects.

Value chain for fleet electrification



The upstream segment of the e-mobility value chain focuses on developing and providing the essential assets required in the sector

The upstream part of the value chain comprises multiple levels, working towards creating the necessary assets required within the e-mobility space. It can be categorised into three major segments:

Fleet procurement

Fleet operators can lease or purchase vehicles, decisions that come with distinct financial and operational implications.

To facilitate these acquisitions - they often partner with OEMs and financial institutions, such as banks, leasing companies, or investors. This collaborative approach enables them to lease or directly purchase vehicles for their drivers or company.

Examples of companies employing the leasing model include DiDi and BluSmart, showcasing the practical application of these strategies in the industry.

Fleet financing

Operators are increasingly adopting electric fleets due to various government subsidies and purchase incentives. These incentives are further supported by loans or green loans from banking institutions and asset management companies, funding from private equity investors, and attractive financing schemes offered by OEMs.

For example, Bank of America offers EV financing, including loans for EV charging infrastructure. Similarly, the financial group Macquarie has launched a financing platform to accelerate India’s transition to electric vehicles.

Infrastructure

The efficiency and profitability of electric fleets depend significantly on the availability of supportive infrastructure, including private depots, connections to the energy grid, and accessible charging hubs or stations.

DiDi and BP formed a joint venture to build electric vehicle charging infrastructure in China and Evgo runs an EV charging discount program for drivers on the Lyft rideshare platform

Snap-E partnered with CHARGE+ZONE to set up a charging infrastructure for its fleet of 2000 electric cabs.

Mid-stream operations encompass two primary components: Fleet management software and FaaS

The fleet management software integrates technologies such as cloud computing, data analytics, and connectivity, serving as the foundational layer for online services. On the other hand, fleet as a service (FaaS) operates as the consumer-facing layer, where end-users physically utilise fleets, accommodating both B2B and B2C models.

Fleet management software

EV fleet operators adopt fleet management software to monitor their vehicles, equipment, and drivers from the application. Such software also allows for the more efficient management of electric vehicle charging needs.

For example, BluSmart, a pure electric MaaS operator from India, leverages its fleet management software, enhanced by data analytics and AI algorithms. This setup intelligently handles ride assignment operations by considering various critical metrics, including the battery's State of Charge (SoC), distance to the nearest charging hub, trip requirements, and availability of charging stations.

Fleet as a service (FaaS)

FaaS represents a crucial revenue-generating component of the MaaS value chain, serving as the primary interface between MaaS providers and their customers. EV fleet operators leverage their fleets to offer mobility services, including ride-hailing, ridesharing, and ride-pooling, facilitating the transportation of people with enhanced efficiency.

A key to customer satisfaction and service usability is user-friendly and technologically advanced applications or platforms for effortless ride bookings.

For instance, ride-hailing giant Uber Technologies has partnered with fleet operators, such as Lithium, Everest, and Moove, to integrate EVs into its ride-hailing services in India, demonstrating a practical application of the FaaS model.

Downstream operations involve maintaining optimal vehicle conditions, as well as identifying opportunities for the reuse and recycling of batteries and vehicles

Apart from the regular downstream MaaS operations, two pillars emerging for pure EV operators are operations and maintenance of fleets and charging stations and end-of-life operations, where the identifying reuse, refurbishment, and recycling of batteries can be the key to opening new value pools for MaaS operators.

Operations and maintenance

Service quality significantly depends on the vehicle's condition and necessitates regular servicing, timely quality checks, cleaning, and sanitisation.

Fleet operators often collaborate with OEMs or leverage existing garage set-ups to meet high-quality service standards. This collaboration ensures optimal vehicle maintenance and opens new revenue streams by offering maintenance services to other fleets.

An example of this practice is ComfortDelGro Taxi in Singapore, which provides annual maintenance services for private passenger cars and commercial vehicles.

End-of-life operation

The fleet life cycle strategy is to replace a vehicle before maintenance costs and downtime exceed the benefits of keeping it. Both batteries and vehicles play a significant role at this stage of the value chain. EV batteries, especially, can be reused for other stationary energy needs and can be further recycled for extracting battery minerals.

Battery recycling is a sustainable approach to battery management. Batteries can be repurposed for energy storage systems such as decentralising power grids or storing excess energy. They can also be sent to recycling centres where essential minerals can be extracted for reuse.

For pure EV operators, managing fleet and charging station operations and maintenance and end-of-life operations are critical. Identifying opportunities for reuse, refurbishment, and recycling of batteries can open new value pools for MaaS operators.

Stellantis N.V. and Orano have established a joint venture for recycling end-of-life electric vehicle batteries and scrap from giga factories in Enlarged Europe and North America.

Business models

Business models:
Defining the success rate and scalability of Maas operators

With digital transformation, the fleet aggregation sector is experiencing a radical overhaul, primarily driven by the electrification of vehicles and the emergence of novel business models. Fleet operators are facing two primary challenges in determining the best operating model: balancing sustainability with economic viability and deciding asset ownership. They form the bedrock upon which fleet service platforms operate, facilitating convenient, cost-effective, and eco-friendly transportation services.

Central to the transformation in the electric fleet landscape are two predominant business models: **asset-light, and asset-owned**.

Companies like Uber and Ola champion the **asset-light model**, leveraging technology platforms for ride-hailing, ridesharing, and ride-pooling without owning the vehicles, permitting agile scaling. Although this model cuts down on capital investments and broadens profits, it often faces challenges in ensuring service consistency and managing supply.

On the other side, the **asset-owned model**, as seen with firms like Sherbet the Electric Taxi Co. and MOIA, demands considerable capital investment but provides a steady supply, enhanced control, and additional revenue streams, such as leasing and charging stations, laying a solid foundation for maintaining consistent service quality.

Major business model dynamics from the sector

Table 1: Electric fleet services business models details

Business model sector	Mappable revenue streams	Performance
Asset-light model: Aggregator model where assets are not directly owned by the operator; the MaaS players focus on the platform.	Ride-hailing	While this model allows faster scalability, challenges like inconsistent service quality and a lack of control over supply persist.
	Ride-sharing	
	Ride-pooling	
Asset-owned model: Mobility service providers own and operate the assets required to offer the services.	Leasing or rental of cars	While this model ensures control and consistent quality, its capital-heavy nature can stymie rapid expansion. Some operators, such as Lyft and ComfortDelGro Taxi, employ a hybrid approach, blending the asset-light and asset-owned models.
	Ride-sharing	
	Ride-hailing	
	Charging station/Refueling stations	

Innovative integration of business models to enhance operating revenues for fleet operators

To fully unlock the potential and revenue opportunities of the asset-light and asset-owned models, it is necessary to combine technological innovations, strategic partnerships, and regulatory compliance. A notable trend in the sector is the hybrid business model, which leverages the best approaches to maximise the benefits and boost revenues.

In the evolving world of fleet electrification, shared services are becoming more common as businesses use their internal capabilities to offer services to external parties. Examples of this include the increasingly popular 'platform-as-a-service' and the emerging 'charging-as-a-service' models that are pertinent in the era of electric mobility. This strategic focus towards modular and adaptable business models highlights the MaaS sector's dynamic adaptation to the complex demands of global mobility.

Platform operators face strategic choices regarding OEM partnerships, opting for either OEM-centric or agnostic approaches. Additionally, electric and autonomous vehicles in their fleets demonstrate a commitment to introducing more sustainable transportation options.

Table 2: Types of ride services offered to commuters by various fleet operators

Mobility-as-a-Service segment	Description	MaaS Players
Ride-hailing	Involves booking a ride via a MaaS platform for a single rider or multiple riders from the same location, travelling from point A to point B, without the option for shared bookings of the same cab by different parties simultaneously.	Uber, Didi, Ola, BluSmart
Ridesharing	Involves booking a shared ride via a MaaS platform, accommodating multiple riders with different pickup and drop-off locations in a single cab.	Uber, Didi, and Ola
Ride-pooling	Privately owned car owners offer seats through a MaaS platform, allowing them to share the trip with other commuters. This service typically operates between fixed pickup and drop-off points, with no deviation from the set route.	Bla Bla Cars

Table 3: Types of shared mobility business models by various fleet operators

Mobility-as-a-Service segment	Description	MaaS Players
OEM agnostic platform operators	Platform operators that procure vehicles from multiple OEMs to provide ride services, including ride-hailing, ridesharing, and ride-pooling.	Uber, Didi, Ola, BluSmart
OEM-centric platform operators	Platform operators that procure vehicles from a single OEM to provide ride services, such as ride-hailing, ridesharing, and ride-pooling.	Waymo, Cruise

The Total Cost of Ownership (TCO) analysis: What does it indicate?

The Total Cost of Ownership (TCO) analysis: What does it indicate?

The relationship between business models and the total cost of ownership of electric vehicles is crucial. Even in non-subsidised regions such as the Middle East, electric vehicles (EVs) are approaching cost parity with combustion engine vehicles.

Business models significantly impact cost dynamics, particularly in vehicle acquisition. For example, the leasing or asset-light model reduces the initial financial burden by replacing high procurement costs with manageable leasing fees, according to specific agreements. However, when individual drivers contribute their vehicles to the platform, financing complexities can emerge, mainly due to drivers' unestablished financial records and unclear credit histories. This situation often leads to premium financing rates, typically rising 10-15% above the standard in developing economies.

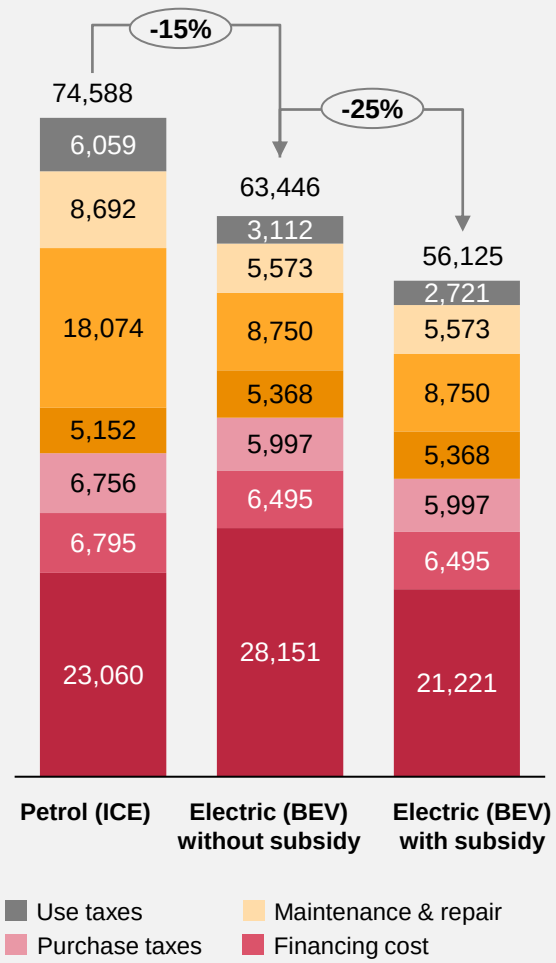
Alternatively, the asset-owned model increases capital expenditure (CAPEX) on the balance sheet but allows fleet operators to negotiate directly with OEMs. This approach can lead to potential subsidies, tailored maintenance schemes, and exclusive warranty agreements, resulting in significant cost savings. Additionally, ownership offers strategic benefits, such as streamlined operations, reduced overhead, and eliminated resource redundancies.

The following analysis delves into the intricacies of the total cost of ownership, aiming to highlight the cost advantages of transitioning from ICEs to EVs. The two charts show a comparison of TCO for ICE vehicles and EVs in Germany and the UAE.

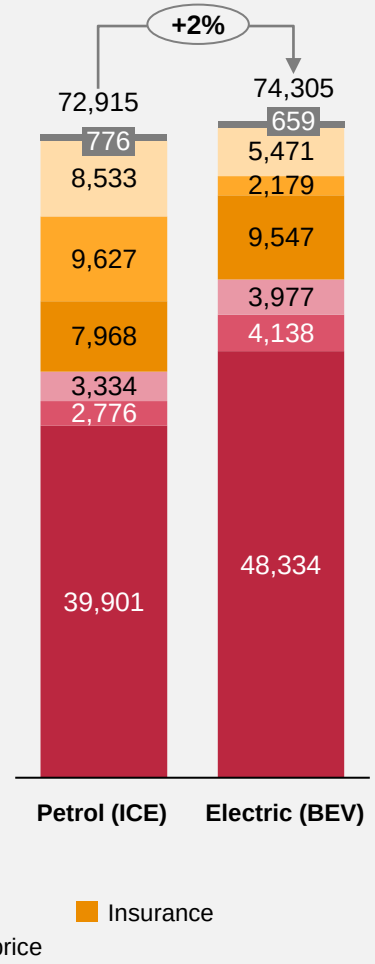
In Germany, thanks to government subsidies, EVs enjoy a cost advantage, with the average TCO for electric vehicles being 25% lower than that for combustion engine vehicles over five years and 150,000 km of total mileage.

However, in the UAE, under similar usage terms, the average TCO for electric vehicles is 2% higher compared to ICE vehicles. While EVs are nearing cost parity in the UAE, the introduction of purchase subsidies could significantly enhance battery-electric vehicles' (BEVs) competitiveness over ICE vehicles, potentially transforming the UAE into an EV-friendly market.

Germany: Average Total Cost of Ownership (TCO) per drive type over ten model pairs[1]



UAE: Average Total Cost of Ownership (TCO) per drive type over eight models

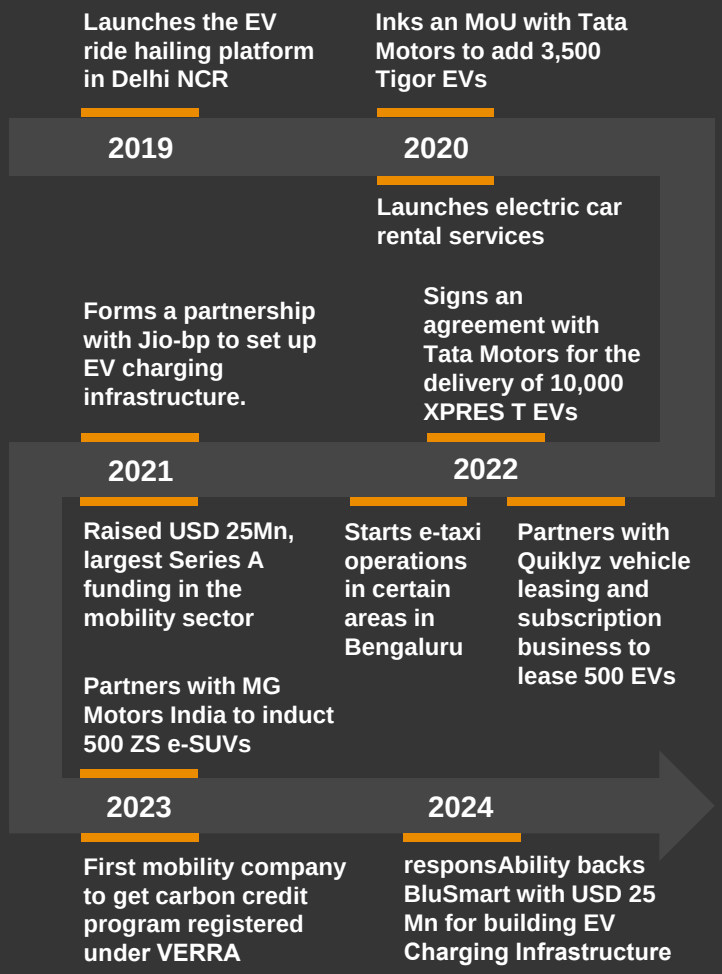


Use taxes
Purchase taxes
Maintenance & repair
Financing cost
Fuel
Net price
Insurance

Note: For Germany, the analysis vehicles considered are BEVs - BMW iX3, Citroen e-C4, Mercedes-Benz EQA, Opel e-Mokka, Peugeot e-2008, and VW ID.3; and ICEs - BMW X3, Citroen C4, Mercedes-Benz GLA, Opel Mokka, Peugeot 2008, and VW Golf. Similarly, for the UAE, the analysis vehicles considered are BEVs - Audi Q8 e-tron SUV, BMW iX xDrive50, Hyundai Kona Electric, Mercedes-Benz EQE, and MG ZS EV; and for ICEs - Audi Q8 SUV, BMW X5 40i M Sport Pro, Chevrolet Groove, Hyundai Kona, Mercedes-Benz E-Class, and MG RX5.

Case studies

BluSmart – Pure-play electric fleet operator



How BluSmart encourages sustainable transportation in urban India with affordable and safe rides

Founded in 2019, BluSmart is India's first pure-play electric shared smart mobility platform building an integrated energy infrastructure, mobility and technology business to "Decarbonise Mobility at Scale".

Business strategy: A transformative shift in urban transportation through a 'born electric, full-stack, integrated approach'. Emphasis on strategic financial modelling, robust partnerships, and leveraging in-house data analytics to optimise operations and foster seamless user experiences.

Fleet

- Procures vehicles on a monthly lease from leasing companies that purchase vehicles from OEMs.
- Collaborates with asset financing companies, such as Energy Efficiency Services Limited (EESL) and Quiklyz, introducing a vehicle leasing model to mitigate the initial capital outlay for Evs.

Technology

- Developed its proprietary backend technology platform, enabling customers to schedule rides, track ongoing trips, and make payments seamlessly.
- Developed an app for drivers, facilitating on-duty reporting, asset takeover/handover, servicing trips, and tracking earnings.
- A patented innovative technology utilises a combination of algorithms, real-time data analysis based on state of charge (SOC) in the EV, and smart decision-making to streamline the process of matching passengers with available vehicles and riders).

Charging

- Partners with charge point operators, such as Jio-bp, to build charging stations for powering their EV fleets.
- Opts to invest in captive charging stations, ensuring drivers can reliably charge their vehicles during operations.

Source: Company website, press releases, and secondary research

Highlights*

6,000+
EVs in operation

4,000+
Chargers

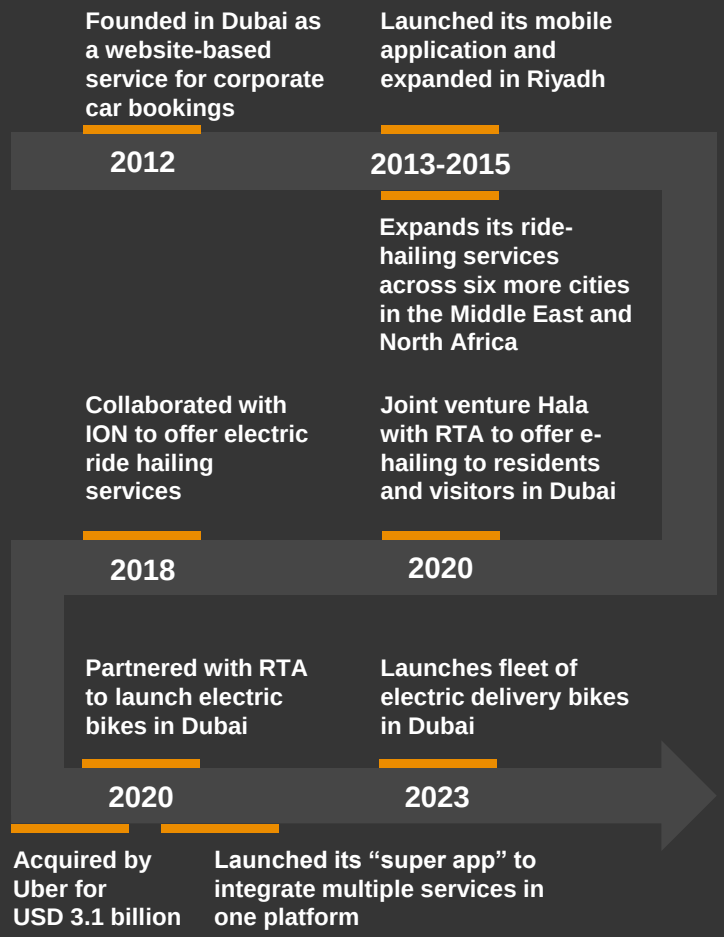
28 million tones
CO_2 saved

360+ million
Clean kms covered

11 million
All electric trips

*As of December 2023

Careem – Platform-based fleet operator



Careem has taken substantial strides to reduce carbon emissions by increasing the share of electric (EV) and hybrid cars in its fleet.

Founded in Dubai in 2012 as a web-based service for corporate car bookings, the company has evolved into a 'Super App.' This mobile platform now offers a range of services, including ride-hailing, food and grocery delivery via e-bikes, micro-mobility solutions, a digital wallet, and various fintech services tailored for EVs.

Business strategy: Fosters alliances and synergies with other businesses to expand the reach of its ride-hailing services. Embraces technological innovation to build a unified platform that meets diverse customer needs within a single app. This approach helps to create a robust and versatile portfolio, capitalising on market trends, enhancing user engagement, and seizing emerging opportunities.

Fleet

- Careem does not own any vehicles; instead, the vehicles are owned by the captains/drivers who register themselves on Careem’s digital application to provide mobility services to customers.
- In some instances, the company partners with financing companies and institutions, such as Abdul Latif Jameel Finance, JS Bank, Telenor Bank, and UBL, to assist drivers in obtaining vehicle finance and loans for their cars. It also collaborates with OEMs like General Motors to offer unique opportunities that support car ownership for their captains.
- ION (a joint venture between Crescent Enterprises, the UAE-based diversified conglomerate, and Bee'ah, the Middle East's leading and award-winning environmental management company) has collaborated with Careem to offer their electric vehicles for commercial use through Careem's ride-hailing application in the UAE.

Technology

- Developed its digital platform comprising three panels: a driver panel that allows users to register as drivers and accept trips; a user panel enabling customers to conveniently book rides; and an admin panel for managing drivers and riders, setting up fares, and tracking each ride.
- Launched its joint venture, Hala Ride Dubai, with the Roads and Transport Authority (RTA), integrating Careem’s e-hailing system with RTA’s taxi management systems. Through Careem’s app, RTA’s taxi drivers receive e-hailing service requests from customers, and it also links their credit cards for easy, hassle-free payment.
- Built an AI-powered platform to provide customers with a more personalised experience and to conduct targeted facial-recognition checks of their captains, aiming to detect any potential imposters.

Charging

- Currently, **Careem** captains need to charge their electric vehicles through public charging stations or using personal **chargers.**

Source: Company website, press releases, and secondary research

Highlights*

2.5 million+
Captains registered on the app

700+ Tesla & 4,500 hybrid
vehicles comprise the EV fleet currently in operation throu gh the app

More than 50%
trips completed with hybrid or EV

*As of December 2023

Waymo – Self-driving fleet operator

2009 – Google Self-Driving Car Project began

2015 – First fully autonomous ride on public roads started in Austin, TX

2016 – Waymo spun out of Google and became an independent self-driving technology company

2018 – First commercial autonomous ride-hailing service initiated

2021 – Expand the Wamo One fleet by partnering with Geely to offer fully autonomous, electric ride-hailing vehicles in the U.S.

2024 – Waymo autonomous fleet becomes all-electric

How Waymo encourages sustainable, convenient and safe mode of transport while reducing traffic fatalities

Waymo, an autonomous driving technology company, originated from the Google Self-Driving Car Project in 2009. It has developed the Waymo One autonomous ride-hailing service that operates in Metro Phoenix, San Francisco and is ramping up in Los Angeles County and Austin, Texas.

Business strategy: Enhancing mobility access through autonomous driving, thereby reducing traffic-related injuries and fatalities. Autonomous ride-hailing fleets would also extend services to individuals unable to drive, including the elderly, the visually impaired, or those with disabilities.

Fleet

- Waymo's autonomous ride-hailing fleet consists of all-electric Jaguar I-PACE vehicles, powered by the advanced fifth-generation Waymo Driver autonomous driving system.
- In 2021, Waymo partnered with Geely to introduce fully autonomous, all-electric vehicles to the public. This collaboration involves integrating the Waymo Driver system into Zeekr vehicles, which are optimised for transportation-as-a-service (TaaS) applications.

Technology

- Waymo’s fifth-generation Waymo Driver, based on machine learning, utilises data to enhance its understanding of the surroundings, driving patterns, etc., with every mile travelled. This informs the determination of the precise trajectory, speed, lane, and steering manoeuvres required for safe navigation throughout its journey.
- Waymo has developed a single integrated system comprising sensors and computing power designed to work in unison, providing the Waymo Driver with a comprehensive view of its environment.

Charging

- Waymo has invested in and operates its charging infrastructure, thereby managing its electricity supply and powering the fleet with 100% renewable energy.
- In 2022, the company purchased more than 6,200 megawatt hours of solar and wind energy.
- Waymo One EV fleet vehicles are designed to automatically route to the nearest charger when low on battery and return to the main operations centre for maintenance.

Source: Company website, press releases, and secondary research

Highlights*

500+
Robo-taxis in operation

20+ billion
real-world and simulated miles driven

10,000 +
Zero-emission trips per week

*As of December 2023

Recommended key strategies

We recommend certain key strategies for fleet operators to successfully overcome barriers in transitioning to electric fleets.

Enabling government policies and regulations

Rationale

The high initial upfront cost of EVs and the lack of funding for setting up charging stations present significant barriers to fleet electrification.

Recommendation:

Leverage government incentives, tax exemptions, and subsidies for EV procurement to alleviate the short-term financial burden associated with purchasing EVs.
Utilise government incentives in the form of tax credits, rebates, or grants to reduce the overall installation costs of charging stations.

Charging Infrastructure

Rationale

The challenge lies in the limited accessibility to charging hubs/stations and managing grid capacity for fleet charging.

Recommendation:

Priorities the establishment of an in-house, dense charging network to enhance operational efficiency.
Monetize the service by making it available to the public, which can provide an additional revenue stream.
Collaborate with CPOs/EVSE providers to access charging at multiple locations conveniently. Share the installation costs of charging infrastructure and consult with utility companies regarding grid capacity and electricity pricing strategies.

Market-fit Products and Services

Rationale

Limited availability of commercial EV models for fleet operators, initial cost of fleet procurement and the need for specialist EV technicians with expert knowledge and skill set.

Recommendation:

Introduce EV models tailored for the market with higher battery capacity to ensure long driving ranges and seamless operations, catering specifically to the needs of fleet operators.
Forge partnerships with OEMs and financial institutions to offer flexible financing and leasing options that mitigate the initial cost barrier for fleet electrification.
Invest in comprehensive training programmes for technicians, focusing on EV-specific diagnostics, tools, and maintenance techniques to uphold service quality and vehicle reliability.

Digital enablement

Rationale

Inadequate insights into battery state of health, range anxiety, unscheduled vehicle downtime, security threats, and the absence of real-time information for fleet monitoring are obstacles.

Recommendation:

Enhancing the sophistication of telemetry and Internet of Things (IoT) technologies will empower fleet managers to monitor battery health accurately, optimise routes, track vehicles in real-time, manage driver behaviour, implement predictive maintenance, and accurately calculate charging costs and savings. This approach mitigates operational risks and positively impacts the bottom line by improving efficiency and security.

Battery recycling

Rationale

Recycling batteries and EV components is challenging due to the harmful chemicals they contain, which must be disposed of properly.

Recommendation:

Collaborate with OEMs or recycling companies to resell EV batteries or repurpose them for energy storage applications.
Partner with utility companies that can reuse the batteries for static storage on their grids.

The shift towards electric mobility for Mobility-as-a-Service (MaaS) fleets is a positive change. It will allow transportation companies to meet the evolving needs of customers and comply with regulations, all while reducing their carbon footprint. This will help them improve their products, reduce risks, and lower their environmental impact. By adopting the right business models and growth strategies to transition to electric vehicles, the MaaS industry can rapidly position itself for long-term success.

Contact us

For more information about how we can help you shape a sustainable mobility ecosystem for generations to come, please contact:

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Thank you!

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