SPARK!
Partnering to electrify in Europe

Uber

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Foreword

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As the largest mobility platform in the world we have a responsibility to tackle the climate crisis head on. Cutting harmful transport emissions is a complex and daunting challenge for companies, cities and citizens, but it is a vital and urgent one and we all have a role to play.

Yesterday was the first International Day of Clean Air for blue skies, when the United Nations called upon 'everyone from governments and corporations to civil society and individuals to take action to reduce air pollution'.

Today we are answering that call by committing to make a seismic shift in our business, substantially electrifying our platform in Europe, and taking an important step on the journey to becoming a zero exhaust emission platform all around the world.

We are also announcing a number of new partnerships. Electrifying ride-hailing is complex and Uber cannot do it alone. First and foremost, any such change must make sense for drivers. Drivers are independent and, like consumers, they make their own choices. An electric vehicle must make sense for them, both practically and financially. Charging in particular raises a host of new challenges. We are therefore seeking to partner wherever possible with charging companies, carmakers and cities to create the economic and policy conditions that make electrification work for drivers.

This report lays out some of the steps that we believe private and public bodies can take together to help make this a reality. Those same steps around charging, vehicles and policymaking will also benefit the average consumer, and we firmly believe that electrifying commercial vehicles can act as a catalyst to accelerate electrification across society.

COVID-19 has impacted millions of people across Europe and around the world, and it is rightly dominating society's attention. While individuals and economies have suffered terribly, there has been one silver lining that we would all wish to hang on to - a temporary reduction in carbon and pollution emissions, particularly in cities. We all hope and expect that sooner or later we will emerge from the shadow of the pandemic. But what about the climate crisis? It hasn't gone away. It has never been more pressing. If we fail to act now, all of our futures are at risk.

We don't want to go back to business as usual. Uber is taking this unique moment to commit to reducing the environmental impact of trips on our platform. By 2040, all rides across all global markets will be in vehicles without any exhaust emissions - whether it's a car, bike or scooter - or on public transport.

In Europe, however, where policymakers are leading the way on electrification, we believe that we can become a zero exhaust emission platform much faster. As this report explains, by 2025, 50% of kilometres driven on the Uber app in aggregate across seven European capitals (Amsterdam, Berlin, Brussels, Lisbon, London, Madrid and Paris) will be in electric vehicles with no harmful exhaust emissions.

This is just the beginning. If cities, NGOs, ride-hailing companies, carmakers and charging operators all work together to create the right conditions, we believe that ride-hailing could then be electrified in any major European city within five years.

To make this happen, drivers need access to affordable electric vehicles; they need reliable access to overnight charging at or near their home; and, in the interim, additional policies may be needed to close the cost gap that drivers face when making the switch. Once these three barriers are addressed, we believe that commercial drivers will be able to electrify in just a few years, and that the mass market will follow.

The European Commission's Green Deal sets out a bold vision for a better world, and it is a vision that Uber applauds. We are committing significant resources to this transition and that commitment will only increase. We will look to use our scale, data and expertise, in partnership with governments and industry to help drive towards an electric future in Europe. In doing so we hope to help policymakers build cleaner, healthier, more liveable cities, and to play a small part in Europe's ambitious plans to lead the world in reaching net zero carbon emissions.

TRANSPORT & ENVIRONMENT

"Emissions-free mobility is cheaper as well as better for our health, the climate, and the environment. In European cities this means more walking, more cycling, and shared electric vehicles. Uber's commitment to electrify is a good starting point and must now be fully implemented. But in order to phase out fossil fuel vehicles from our streets, high-kilometre vehicle operators and electric vehicle drivers need a better charging network. Hundreds of thousands of new charging points at home, at work, in business and leisure premises, and in dedicated charging hubs are needed. Zero-emission zones in city centres and emissions-based charges are also required to accelerate the phase-out of the internal combustion engine. Finally, we need policies and local regulations that require emission cuts from all high-kilometre vehicles and that lift restrictions (such as 'return-to-garage' rules) for fleets that operate all-electric vehicles. The vision of emissions-free mobility implies that all players must chip in to accelerate the transition. Uber's announcement is a good first step in the right direction, but many more are needed, and everyone needs to join the transformation."

eit Urban Mobility

EIT Urban Mobility is supported by the EIT, a body of the European Union

"Air pollution and CO_2 emissions are detrimental to public health, the environment and quality of life in European cities. Technologies and solutions for clean, connected and shared mobility already exist but we need to integrate them, accelerate their implementation and scale them. EIT Urban Mobility is all about bringing together public authorities, industry, researchers, academics and citizens to jointly establish integrated solutions. Greater political and societal willingness to take action on the climate emergency have opened the window to a new mobility paradigm - one that is clean, affordable, efficient, inclusive, safe and enables the equitable use of public space. Electric and shared mobility are both key to making urban transport sustainable. EIT Urban Mobility therefore supports Uber's efforts and ambition in committing significant resources to electrification and bringing together different players to cooperate."

International Transport Forum

"Ride-hailing services and taxis provide clear value to people. As a part of a broad urban mobility ecosystem, they can contribute to more sustainable urban travel - if the environmental impacts over their whole lifecycle are addressed. There are several ways to reduce the environmental burden of these services as work by the International Transport Forum shows: reducing empty vehicle travel, increasing the number of passengers carried per kilometre driven while avoiding a shift to ride-hailing and taxis from public transport and other, more sustainable modes and fostering a rapid transition towards electric vehicles - especially for vehicles that travel a lot every day. Uber's ambitious commitment to rapidly electrify its fleet outlined in its SPARK! report is thus a welcome step in delivering more sustainable mobility outcomes."

"POLIS cities and regions have been working towards a sustainable multimodal urban mobility ecosystem for many years. We welcome Uber's continued efforts to exchange with POLIS and its members, as well as its commitment to improve the roll-out of electric vehicles and charging infrastructure. As rightly noted in Uber's SPARK! report, only through common efforts of various stakeholders and a comprehensive approach, will we be able to bring about substantial change, and reduce noise, air and greenhouse gas emissions in our beloved cities."

Global New Mobility Coalition
World Economic Forum

"If high-kilometre drivers in cities move to electric vehicles at scale, it will make a huge difference for climate and clean air: they will do so if the economic barriers can be eliminated. Uber's commitment to take on this challenge in very practical ways is a great example for private sector engagement and creative partnerships with public agencies."

"Electrification is the key to future movement and delivering net zero transport. Uber's sustainability goals chime well with our net zero ambition. bp wants to create the fastest and most convenient network of charging options, for people to use at home or on the go. One of our electrification goals is to provide access to a dedicated charging network that serves the needs of ride-hail and fleet drivers."

power dot
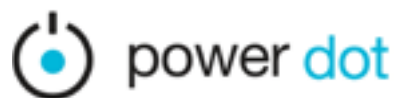
"We believe that our cities' sustainability depends on shared and electric mobility. Together with Uber, we have the opportunity to accelerate this shift by creating a dedicated charging network that drivers can trust and rely on."

GROUPE RENAULT   **NISSAN** GROUP OF EUROPE

"The Alliance partners Renault and Nissan are pleased to be working together with Uber to bring market-leading electric vehicles to its drivers and customers, and to continue the democratisation of electric mobility for all."

Acknowledgements

Glossary

BEV
Battery electric vehicle. A vehicle with no combustion engine. Runs exclusively on electricity

CCZ
Congestion charging zone. An urban area which some or all vehicles need to pay to enter

CO₂
Carbon dioxide. A GHG and the primary driver of climate change

EV
Umbrella term for all vehicles with an electric motor. Includes BEVs, HEVs and PHEVs

GHG
Greenhouse gas. Traps heat in the earth's atmosphere, causing climate change

HEV
Hybrid electric vehicle. An ICE which can also run on electricity stored while driving

High-kilometre driver
A driver who drives several multiples of the national average driving distance. Includes many commercial drivers such as ride-hail, taxi and delivery drivers

ICE
A vehicle with an internal combustion engine

LEZ
Low Emission Zone. An urban area where vehicles above a certain emission threshold are not allowed or need to pay to enter.

Long range BEV
In this report, taken to mean a BEV that can reliably manage a full driving day on a single charge in real world conditions

Near home charger
A charger at or within a short walk of a driver's home, ideal for charging overnight

Normal charger
Charges at speeds between 7-22 kW. The most common type, ideal for fully charging overnight

NO$_x$
Nitrogen oxides. Includes NO and NO$_2$. The latter can cause serious environmental and health problems

Opportunity cost
Lost revenue from time off the road charging which would otherwise be spent earning

PHEV
Plug-in hybrid vehicles. An ICE which can also run on electricity supplied from the grid

PM
Particulate matter. Can penetrate the lungs and bloodstream causing a range of health issues

Rapid charger
Typically 50 kW. Good for top ups or charging quickly

Slow charger
Between 3-5 kW, sometimes in lamp posts. Often too slow to fully charge overnight

TCO
Total cost of owning and operating a vehicle. A convenient way to compare costs of vehicles

TCO gap
The cost gap between owning and operating two different vehicles. In this report it mostly refers to the gap between BEVs and ICEs

Uber Green
A product offered in some cities which guarantees a trip in a cleaner vehicle

Ultra rapid charger
100+ kW. Relatively new and rare. Many EVs cannot charge at this speed

ZEV
Zero emission vehicle. Includes BEVs, as well as others such as those powered by hydrogen

ZEZ
Zero emission zone. An urban area where only zero emission vehicles are allowed. Other vehicles are not allowed or need to pay to enter

Executive summary

The pressing need to cut harmful transport emissions is one of the most urgent challenges of our era. It is both an environmental goal and a moral imperative; nitrogen oxides (NO_x) and particulate matter (PM) can cause irreversible and often fatal respiratory health issues, while carbon dioxide (CO_2) emissions contribute towards the climate crisis. Yet transport has the most ground to cover of any EU sector when it comes to reducing its environmental impact, lagging well behind power, housing and heavy industry **(Chapter 1)**.

Policymakers across Europe are alive to this challenge and are setting the foundations for ambitious change across the European economy. The European Commission's Green Deal sets out a bold roadmap to reshape how our societies operate, shifting them onto a more sustainable footing with €260 billion of additional annual investment for the next decade - about 1.5% of GDP. Transport forms a core part of this vision, and we share the Commission's belief that "transport should become drastically less polluting, especially in cities".[1]

> **Transport should become drastically less polluting, especially in cities**

There can be no solution to this challenge that does not result in the near-total elimination of emitting vehicles from our roads. More people need to walk, cycle and use public transport. Car journeys need to take place in vehicles with zero exhaust emissions, such as battery electric vehicles (BEVs) rather than those using conventional internal combustion engines (ICEs).[2] BEVs reduce exhaust emissions of NO_x and other pollutants to zero and substantially reduce CO_2 emissions over the life of the vehicle when compared to today's average European car.[3] Further reductions are expected as power generation to fuel BEV batteries continues to decarbonise across Europe. More vehicles will be shared, spreading the fixed amount of CO_2 needed to produce a vehicle across a greater number of trips. But there is a long way to go before ICEs disappear from European roads. Though European sales have jumped this year, BEVs accounted for about 1% of global car stock in 2019. Change will need to be delivered at pace.[4]

High-kilometre commercial drivers - a definition which includes most taxi drivers and ride-hail drivers, but also others like delivery drivers, some providers of home services and so on - are critical to this change. Although relatively small in number they each drive a lot – the typical vehicle in the UK travels roughly 12,000 kilometres each year[5], whereas a ride-hail vehicle might clock up around 45-50,000 kilometres, four times as much, or more in some cases. Promoting electrification among this group will therefore have an outsized environmental benefit, as well as establishing a cohort of early adopters that can stimulate the conditions needed for mass electrification across society.

> **Electrification of high-kilometre drivers will have an outsized environmental benefit**

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1. Communication from the Commission (2019), The European Green Deal

2. In this report we use 'BEV' (battery electric vehicle) to refer to an electric vehicle with no exhaust emissions. The term 'EV' (electric vehicle) sometimes also includes hybrid electric vehicles ('HEV') and plug-in hybrid electric vehicles ('PHEV'), both of which have a combustion engine and so can emit CO_2 and other pollutants. Other zero exhaust emission vehicles (ZEVs) include those with a hydrogen fuel cell, which are not discussed in this report.

3. Transport & Environment (2020), How Clean are Electric Cars?

4. IEA (2020), Global EV Outlook 2020

5. UK Department for Transport (2019), Annual mileage of cars by ownership and trip purpose: England, since 2002
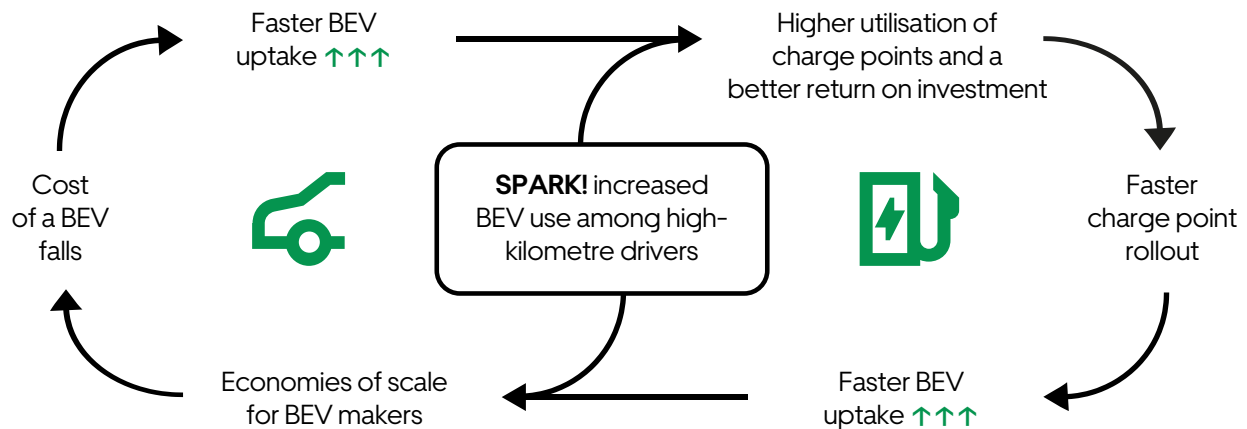
High-kilometre drivers can kick-start BEV uptake across society

Uber's contributions and commitments

Addressing environmental concerns is one of Uber's fundamental objectives. Over the last decade we've already made progress against this goal through a number of product and technological innovations **(Chapter 2)**.

But we recognise that we have a responsibility to do more. Electrifying the trips taken on our platform is our next key environmental priority. The fundamental challenge is to do so in a way that allows drivers to continue to thrive when many drivers today would be worse off economically in a BEV than a conventional option, as this report will explain.

So with our responsibilities to both drivers and cities in mind, we are making a series of ambitious, inclusive commitments to help **SPARK!** electrification across Europe[6] - meaning less pollution, and cleaner, healthier, more liveable cities **(Chapter 3)**.

> Addressing environmental concerns is one of Uber's fundamental objectives

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6. Including, for the purpose of these commitments, the EU27, Norway, Switzerland and the United Kingdom

Switch to become a **50% electric** rides platform by the end of 2025 on an aggregate basis across seven European capitals - Amsterdam, Berlin, Brussels, Lisbon, London, Madrid and Paris

Partner with any major European city to offer **100% electric** rides within 5 years once the economic and policy conditions are in place such that drivers will be no worse off in a BEV than they are in an ICE today - entirely eliminating the use of emitting vehicles

(We believe that no one actor - public or private - can effectively solve this issue alone, but that cities, Uber, carmakers and charging providers can work together to create the conditions for BEVs to be the most practical and cost effective option for drivers. See Chapter 3 for more details on this commitment, and Chapter 4 for the cost calculations underpinning it)

Advocate publicly for inclusive policies on charging, vehicles and incentives to accelerate BEV adoption among high-kilometre commercial drivers and the wider public

Report publicly on improvements in CO_2 emissions per kilometre driven on the Uber app

Keep expanding sustainable options in the Uber app:

- Expand 'Uber Green' from 37 cities today to 60 by the end of next year, offering a cleaner option to passengers across ~80% of our European business

- Further expand our offering of e-bike / e-scooter / e-moped options beyond the 20 cities where they are available today

- Seek to partner with cities and transport agencies to expand our public transport journey planning service from 3 cities today (London, Paris & Lisbon) to 25 within five years

The barriers to change

Electrification is a priority for Uber in Europe and beyond. We are committing significant resources to this transition and that commitment will only increase. But there are important challenges that the industry cannot solve alone. Real change will also require action from national and local governments to generate a supportive policy environment that removes barriers to BEV adoption and ensures BEVs become a feasible choice for drivers of all kinds **(Chapter 4)**.

Three core barriers currently make switching an unlikely economic choice for high-kilometre commercial drivers. These are:

1. **The lack of appropriate charging**

2. **The lack of affordable / second-hand BEVs**

3. **Insufficient financial incentives to close the interim cost gap**

> Uber, carmakers, charging companies and public bodies all have a vital role to play

Collectively, these barriers increase the total cost of ownership (TCO) of a BEV when compared to a conventional vehicle.

What is TCO?

The **total cost of ownership** (TCO) encompasses all the costs of owning and operating a vehicle. This includes the upfront cost of acquiring and registering the car as well as ongoing financing and operating costs such as any loan payments, fuel, insurance and maintenance. A similar analysis also applies to renting or leasing a car.

Importantly, a high-kilometre commercial driver's TCO calculation also includes **opportunity cost**, which is the consideration of lost earnings incurred during the time spent looking for and using a charge point (or in the case of an ICE, a garage to refuel).

While personal circumstances and preferences play an important role, choosing a vehicle that keeps TCO as low as possible is a key way in which ride-hail drivers look to maximise their take home earnings.

Barrier 1: The lack of appropriate charging

In making its bold call to establish one million charging points by 2025, the European Commission recognised the urgent need for more charge points across Europe if BEVs are to be adopted en masse.[7] But they must also be the right kind and in the right places. As battery sizes increase, high-kilometre commercial drivers benefit more and more from being able to reliably charge their BEV overnight at or near their home, or wherever they would normally park.

> More charge points, of the right kind, in the right places

Chargers should be at least 7kW, but ideally 11kW or more, to ensure that they can fully charge any type of BEV overnight. This rules out many slow 3-5kW chargers integrated into street lamps. At the other extreme, rapid charging hubs (50 kW or more) are great for top ups and an important part of the overall picture, but we are still a long way from the point where charging can be as quick as filling a tank with petrol.

For the bulk of ride-hail drivers' daily needs, there are several important advantages to being able to charge overnight at or near home. It is typically cheaper, more convenient and better for the battery; but most important of all, it eliminates the potential for a large opportunity cost of lost earnings incurred during the time spent looking for and using a charge point when they would otherwise be carrying passengers. This time can eat up more than 20% of the revenue that a driver could otherwise earn in an ICE, if they cannot charge in the times and places where they would otherwise want to take a break.

Historically, these kinds of overnight public chargers have often been located in the wrong places for those high-kilometre commercial drivers who would most rely on them. BEVs are expensive and have often been sold to better-off consumers, so public charging infrastructure has also clustered in wealthy areas. High-kilometre commercial drivers, however, often live in more densely populated urban areas where a lack of off-street parking or inflexible building regulations prevent them from installing a private charger at home, and where there is also unlikely to be an overnight public charger reliably available within a short walk of their home.[8]

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7. European Commission (2019), The European Green Deal: Sustainable mobility

8. Map: Charger data from Open Charge Map Contributors licensed under a Creative Commons Attribution-ShareAlike 4.0 International | © Mapbox © OpenStreetMap. Shaded hexagons represent the inferred number of potential normal chargers needed for PHV drivers active on Uber if all were to be in a BEV today. Total 2025 charger demand is based on the forecasted 'high sale, high residential' scenario on p122 of the The Mayor's Electric Vehicle Infrastructure Taskforce (2019), London electric vehicle infrastructure delivery plan
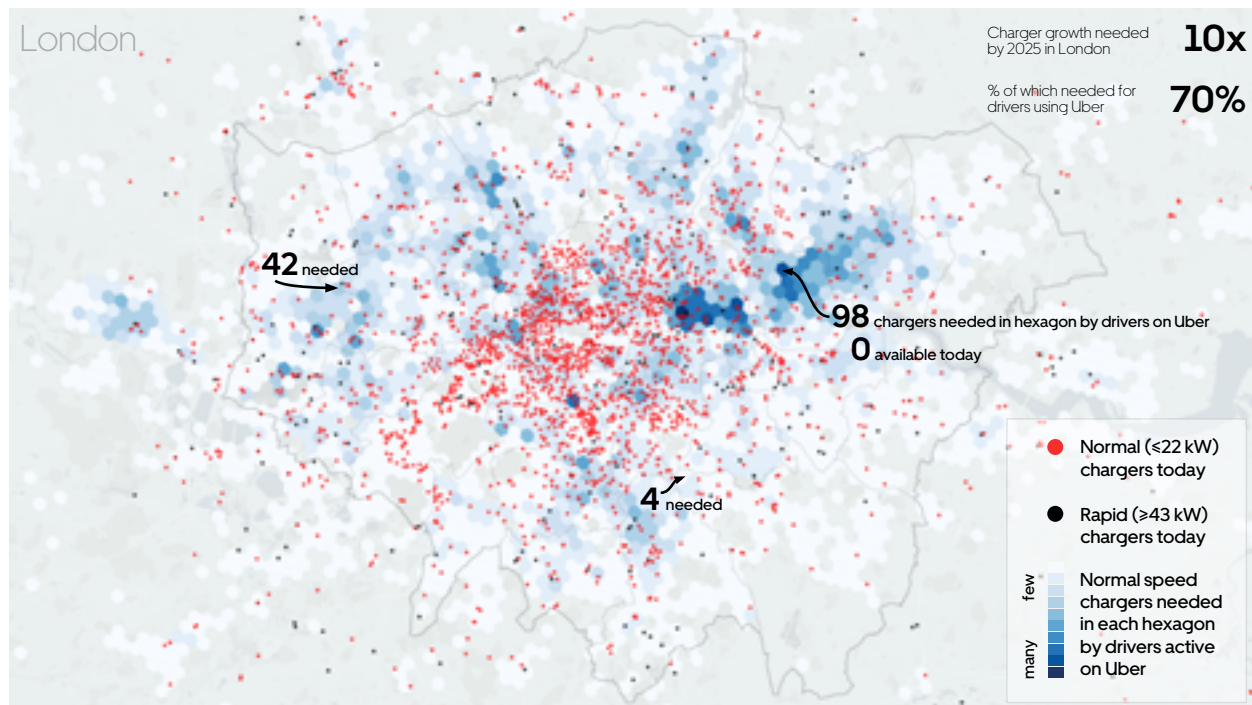
Drivers on Uber will need many times more chargers, and in very different places to today

For many drivers, their only option is therefore to use rapid chargers at central hub locations to which they have to drive. These drivers must choose between the convenience of an ICE and a BEV they can only charge by taking time out from earning. They may be able to adapt their routine to combine charging time with breaks or leisure time, but if not then charging will materially lower their ability to earn.

Access to overnight charging is therefore a critical obstacle for many drivers looking to transition to a BEV. Uber is working with charging companies to provide better access to rapid hub charging and home charging for those drivers who can use it. However widespread, affordable, public overnight charging is still key, and it requires public bodies to allocate land and license its use for charging. It also requires new data driven approaches to building out the network in an economically sustainable way. This is a citywide 'network' problem that is best solved centrally at the city level. It is a big challenge but one that can be met - the success of Amsterdam, for instance, proves that change is possible (see **Chapter 6: Charging infrastructure in Amsterdam**).

Barrier 2: The lack of affordable / second-hand BEVs

The TCO gap is strongly driven by the fixed cost of purchasing a BEV. A new ICE hybrid suitable for ride-hail may cost in the region of €28,000, but ride-hail drivers typically prefer second-hand ICEs which can be purchased for as little as €10,000. Meanwhile, suitable BEV models available today cost ~€40,000, with few second-hand options. A BEV needs to have at least ~400 kilometres of stated range to reliably last a full day on a single charge (accounting for real world performance and charging patterns) which is essential for ride-hail drivers to keep opportunity costs under control. Such long range BEVs are only starting to be sold in significant volumes for the first time this year in Europe, which means they won't become widely available at an affordable price on the second-hand market for at least another 2-5 years. Drivers are therefore faced with a daunting price difference for the vehicle, as well as any opportunity costs of charging. While the subsequent day-to-day running costs of a BEV are typically cheaper than an ICE, these savings do not fully close the gap. Some will also struggle to finance the high upfront cost, another potentially insurmountable barrier.

Barrier 3: Insufficient financial incentives to close the interim cost gap

When the impact of these barriers is assessed collectively, many ride-hail drivers who switch to a BEV today would likely face a significant reduction in earnings unless they have access to a home charger and a generous subsidy to close the TCO gap. The chart below shows the cost calculus that a ride-hail driver who chooses to drive for around 35 hours a week may face when looking to switch to a BEV. It also demonstrates that although policy action across different European cities has narrowed the gap, it has not yet closed it. Generous government subsidies certainly help, but faced with the opportunity cost of charging and an upfront cost gap of up to €30,000 between a new long range BEV and a used ICE, making the leap is still not an economically viable choice for most drivers. While these barriers remain in place, this will continue to be the case for a large proportion of ride-hail and high-kilometre commercial drivers more broadly.

Electrification is still not an economically viable choice for most drivers

Ride-hail drivers' total cost of ownership is often worse in a BEV. Uber is doing what it can to reduce BEV TCO, but more must be done to further tilt the playing field

Assumptions (excludes all subsidies)

Car	ICE: Toyota Prius , €27.5k new, €14.4k used BEV: Nissan LEAF with 62 kWh battery, €40.2k 8% APR finance, 25% resale value after 4 years
Charger	Home charger installation: €1.1k
Fuel	ICE: 4.5 ltr/100 km, €1.25/ltr BEV: 17.0 kWh/100 km, 18c/kWh (home), 28c (rapid)
Maintenance	New ICE: 2.37c/km, used: 3.55c, BEV: 1.69c
Insurance	New ICE: €3,451 / yr, 25% elasticity on car cost
Oppt. cost	Loss of 21% of earning time, less variable costs

Do common policies close the gap?

- Near home charging for all (eg. Amsterdam)
- €11k subsidy on cost of a BEV (Paris)
- £350 subsidy on cost of home charger (UK)
- £15 / day ICE congestion charge (London)
- £150 annual road tax for ICEs (UK)
- **Sum of all of these policies combined**

Policymaking principles

Drivers of all kinds are highly sensitive to economic signals. Few can afford to adopt a new vehicle without considering its cost, particularly when they use their vehicle to make a living. A recent Eurobarometer survey shows that while consumers are ready to switch to more sustainable forms of transport, their main condition for doing so is that it doesn't cost more.[9] In a competitive market, consumer pressure will thus naturally push ride-hail drivers towards the lowest cost option for them and for their passengers. Failing to keep costs low means losing customers to competitors or back to their private ICE vehicles. Overcoming the barriers above means shifting the commercial reality of BEV adoption to be cost competitive with ICEs. Even the most committed private company cannot act alone. Government policy plays a key role in shifting incentives towards accelerated BEV adoption.

While consumers are ready to switch to more sustainable transport, their main condition for doing so is that it doesn't cost more

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9. Eurobarometer survey (2020), Mobility and transport

Part of the solution relies on making public data sources available for use by local agencies and companies in imaginative ways. Imagine how much more easily promising schemes like emissions-based road charging, BEV discounts on parking, emissions-based access to city centres or other ideas could be implemented if real-world emissions profiles of individual vehicles were standardised and electronically accessible to public and private sector innovators. The private sector must also play its part: Uber can help by providing aggregated data on where charging for ride-hail drivers may be required, or by reporting CO_2 emissions per kilometre from trips on the platform **(Chapter 5)**.

At a more fundamental level, and keeping a steady eye on society's environmental goals, our analysis points clearly towards five important principles for policymakers **(Chapter 6)**:

1. **Think in terms of BEV kilometres rather than BEV ownership, with equal treatment for any type of driver who drives the same distance** – replacing those ICEs that are heavily driven with BEVs saves far more CO_2 than replacing those that are mostly parked; that is how governments can maximise CO_2 saved per € spent.

2. **Prioritise change in cities** – since more people live alongside more cars in a smaller area, this is where local air pollution causes the greatest damage to human health.

3. **Apply fiscal incentives to tilt the playing field from ICEs to BEVs** - progressively tilting the playing field with BEV subsidies & ICE taxes can smoothly and equitably accelerate a popular change.

4. **Focus on policies that make BEVs the best economic choice. Bans are most suitable towards the end of the transition to cement, rather than initiate the change** - cities rightly want to encourage drivers to electrify, but bans alone cannot create the positive changes needed for BEV-based transport to work effectively for everyone, right across the city. Price is a powerful lever and market-based solutions can change behaviour fast. But they can also drive a less disruptive and more equitable transition for every type of driver. By ramping up smoothly over several years, price signals from government can accelerate the transition while incentivising the right incremental investments, at the right times, to reduce emissions with the least possible hardship. Bans should come in once market and policy conditions are such that BEVs are already the most affordable choice; implementing them too soon, especially when they don't apply equally to everyone, creates cliff edges which push the costs of environmental improvement onto a minority of drivers with often unforeseen and unfair consequences. The best bans formalise a change that has already happened - as such they are hardly noticed.

5. **Take a comprehensive view of the policy set needed to shift from ICEs to BEVs, including vehicle production, charging and incentives** – the shift to BEVs from ICEs presents drivers and carmakers with a number of variables and unknowns. The public sector must take action across the variety of levers within its control, including increasing subsidies to stimulate BEV demand, developing more residential charging, encouraging a greater supply of affordable BEVs through emissions reduction targets and incentives, and implementing emissions taxes. Each is a link in a chain, and none can be fully effective without each of the others.

Recommended policies and their impact on the cost of driving a BEV ↓ and an ICE ↑

An example of a comprehensive policy approach that follows these principles is set out in the table below. The subsidies and taxes that we have suggested are market-driven measures that either explicitly target high-kilometre drivers or scale on use, saving more carbon for less money. They would apply to all drivers, irrespective of whether they are PHV drivers, taxi drivers, commercial drivers or consumers. They also focus on public charging infrastructure and fiscal incentives, areas that governments are best-positioned to solve.

TCO of BEV vs ICE today	Ride-hail driver ↑↑↑↑↑	City car owner ↑↑↑↑	Rural car owner ↑↑↑
1. Ensure all high kilometre drivers can reliably access overnight charging at or near their home, where they would normally park	↓↓	↓	-
2. Stimulate the rapid development of an affordable / second-hand market for the kinds of long range BEVs starting to be sold new today	↓↓	↓	↓
3. Offer enhanced subsidies and weightings to those BEVs sold to and used by high kilometre drivers	↓	-	-
4. Tilt the economics of everyday use - subsidise charging, while considering new, fairer, more progressive forms of fuel tax	↓	↓	↓
5. Introduce emissions-based road charging in cities	↑↑	↑↑	-
Future TCO vs ICE today	= BEV / ↑↑ ICE	↑ BEV / ↑↑ ICE	↑ BEV / = ICE
	BEVs likely to replace ICEs fast. Drivers make similar living in BEVs	Using BEVs - or public transport - is the best option	Protects rural communities. ICE driving costs are unchanged

This is not the only policy package that would work, and implementation would clearly vary between European countries and cities. However, our analysis suggests that by implementing such a package, it is possible to make BEVs the cheapest option for all urban drivers, commercial and consumer alike. Achieving TCO parity for high-kilometre commercial drivers is therefore key both to assist sectors like ride-hail to go 100% electric, and also to catalyse electrification across all of society, particularly in cities.

This approach:

   ✓ Allows high-kilometre commercial drivers to still make a good living

   ✓ Can raise significant tax revenue for governments

   ✓ Discourages private ownership and use of fossil-fueled cars in cities

   ✓ Creates a cohort of BEV early adopters to stimulate investment in charging and create the economies of scale needed for electrification across society

   ✓ Dramatically accelerates the transition to cleaner, healthier, more liveable cities

If cities, ride-hailing companies, carmakers and charging operators all work together to create the right conditions, we believe that ride-hailing could then be electrified in any major European city within 5 years. This could act as a catalyst for change, driving a broader transition to BEVs and dramatically cutting emissions in cities across Europe. We cannot do it alone, but we know what must be done - and are fully committed to playing our part.

If private and public bodies work together to create the right conditions, we believe ride-hailing could then be electrified in any major European city within 5 years

Chapter 1
Greener European transport – the role of high-kilometre drivers

Transport emissions matter to us all. The emission of greenhouse gases (GHGs) such as CO_2 from the combustion of petrol and diesel has global, cumulative and long-term impact, causing temperature rises that threaten ecosystems across the world. Transport emissions also have even more local and immediate consequences. The emission of pollutants such as particulate matter and NO_x receives less global attention, yet these pollutants affect the quality of the air we breathe, damaging our respiratory health, often irreversibly.

	Damage to global climate	Damage to human health
Key transport pollutants[10]	Primarily CO_2 Small amounts of other GHGs	Particulate matter (PM) Nitrogen oxides (NO_x) Carbon monoxide (CO) Hydrocarbons / volatile organic compounds (HC / VOCs) Sulphur dioxide (SO_2) Ozone (O_3) - secondary atmospheric product of NO_x, CO, VOCs
Transport sources	Exhaust emissions - from combustion of fuel Fuel lifecycle - from refining & transporting fuels Vehicle lifecycle - from manufacture, delivery & scrappage	Exhaust emissions - from combustion of fuel Evaporation emissions - of VOCs in the fuel tank Abrasion emissions - from wear & tear in brakes, tyres etc.
Scope of impact	Global	Individual streets, cities, regions
Longevity of impact	Cumulative, lasts for hundreds or thousands of years	Disperses, but constantly replaced
Type of impact	Long term impact on global climate and ecosystems	Short and long term impact on individuals' respiratory health and ecosystems
Scale of issue in EU	GHG reduction of **22-42%** needed by 2030 (in consultation) GHG reduction of **100%** needed by 2050[11]	**7%** of EU urban residents exposed to NO_2 above recommended level **44%** for PM10 **77%** for PM2.5 **96%** for ozone[12]

Since the Industrial Revolution, the growth of transport of every kind has underpinned two hundred years of economic growth and prosperity – but this sector now accounts for 22% of Europe's greenhouse gas emissions

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10. European Environment Agency (2016) Explaining road transport emissions, A non-technical guide. Includes those regulated within EU transport legislation
11. 22-42% reduction target compares the actual 23% achieved from 1990-2018, to the 40% target for 2030 & the potential raised 55% target being discussed
12. European Environment Agency (2019), Air quality in Europe - 2019 report . Levels based on World Health Organisation Air Quality Guidelines (WHO AQC)

and 55% of NO_x emissions.[13] The emissions profile of transport therefore presents a significant challenge. Only by finding less polluting alternatives to fossil-fuel powered transport can we continue to allow people to conveniently and affordably move around cities while minimising the damage that this causes to the global climate and human health.

Yet despite growing awareness of the problem, greenhouse gas emissions from transport are not slowing down – in fact, trends show quite the opposite. The latest economy wide analysis conducted by the European Environment Agency shows that between 1990 and 2017, GHG emissions from transport grew by 19% while emissions from other sectors fell by 30%. More recent data has also demonstrated that the growing use of sports utility vehicles (SUVs) has caused average emissions from new cars to increase over the period between 2017 and 2019[14]. This has not yet reversed the earlier improvements achieved between 2010 and 2016, but for progress to stall at such an important time is deeply worrying. Recognising the scale of the challenge, the European Commission's Green Deal notes that a 90% drop in transport emissions will be needed by 2050 to achieve Europe's goal of climate neutrality.[15]

Transport as % of EU greenhouse gas emissions, 2017

Road transport: 16% Other transport: 6% Non transport

GHG | 16% | 6%

EU GHG emissions growth / decline by sector, 1990-2017, indexed

Transport +19%
Other sectors -30%

Transport as % other EU pollutant emissions, 2017

NO$_x$ | 28% | 27%
CO | 18% | 3%
PM2.5 | 10% | 10%
PM10 | 8% | 5%
NMVOC | 8% | 2%
SO$_x$ | 12%

EU other pollutant emissions decline, 1990-2017, indexed

NO$_x$ -41%
PM 2.5 -44%
vs 2000
SO$_x$ -65%
Non methane VOCs, CO -87%

Unlike the chronic problem caused by greenhouse gases, the challenge of local pollution is more tractable in the short run. Tighter standards at a European level, developments by vehicle manufacturers and changes in consumption have caused NO_x emissions to fall by 41% between 2000 and 2017 while other pollutants have fallen by as much as 87%.

The level of local pollutants such as NO_2 varies from city to city but also from street to street. It is a focus for many European city leaders including the current Mayor of London. The insights gained from the London Atmospheric Emissions Inventory[16] - a longstanding effort to understand and model how pollution is created and dispersed across the city - have led to the recent introduction of new schemes such as the ULEZ (Ultra Low Emission Zone). This innovative scheme charges older, more emitting vehicles for driving in the centre of London and has substantially improved air quality.[17]

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13. All references in text and following image based on: European Environment Agency (2019), Greenhouse gas emissions by aggregated sector, Emissions of air pollutants from transport, Share of transport greenhouse gas emissions

14. European Environment Agency (2020), Average CO2 emissions from new cars and new vans increased again in 2019

15. Communication from the Commission (2019), The European Green Deal

16. Image: Greater London Authority and Transport for London, London Atmospheric Emissions Inventory (LAEI) 2016. Contains public sector information licensed under the Open Government Licence v2.0

17. Mayor of London (2020), New data shows Mayor's action is dramatically cleaning up London's air
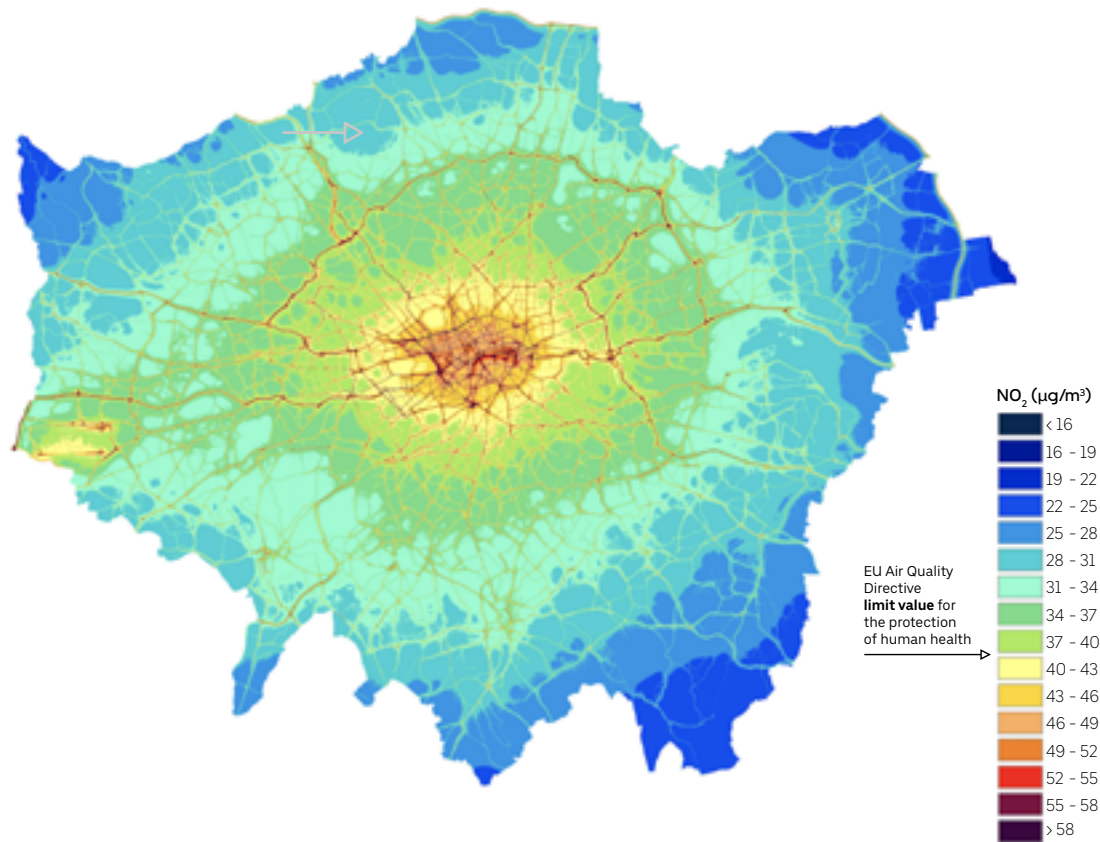
Modelled annual mean NO_2 concentrations in London, 2016

This is an area where the impact of improvements can be felt quickly, as was seen once again during the fall in emissions from transport and heavy industry across Europe during the early, lockdown months of the COVID-19 pandemic. This led to a substantial drop in concentrations of NO_2 across Europe as compared with the previous year.[18]
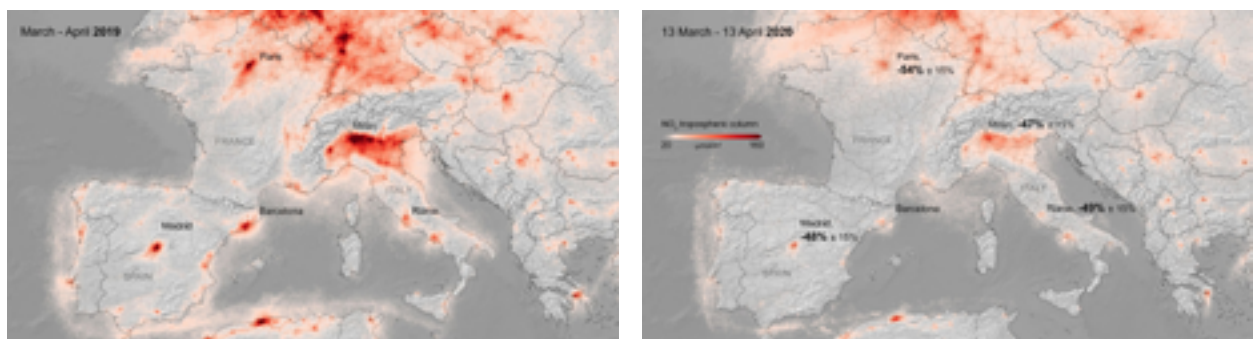
Drop in NO_2 in Europe measured during COVID-19 lockdown

18. European Space Agency, Air pollution remains low as Europeans stay at home. Image: European Space Agency (2020), Nitrogen dioxide concentrations over Europe. Contains modified Copernicus Sentinel data (2019-20), processed by KNMI/ESA

Many harmful local pollutants will dissipate quickly once the source is removed, which can have an almost immediate impact on residents' health.

To reduce emissions of both CO_2 and other pollutants a complete rethink of our transport system is required. More people need to walk, cycle and use public transport. Car journeys will always be needed, but it is vital that they increasingly take place in fewer, shared vehicles with zero exhaust emissions, so as to eliminate many millions of sources of pollution from city streets.

Consumers' green ambitions

Public interest in sustainability is growing - consumers are increasingly seeking to make greener choices, while voters are turning to political movements with greener ambitions.

This is in part because air pollution is a key, localised concern for many consumers living in cities. They can see the health impact that poor quality air is having on children and vulnerable people. It also represents the gradual awakening of broader environmental concerns and an awareness of the damage being wrought on the climate.

This is creating political momentum. Across Europe, governments are talking up the importance of their environmental commitments. In the most recent European Parliament elections in May 2019 green candidates were particularly successful.

It also reflects individuals' intentions as consumers. In France, survey data suggests that 68% of consumers are planning to adopt more environmentally friendly behaviour following the COVID-19 pandemic.[19] Specifically in relation to Uber, 29% of passengers say that they will make greater use of our lower emission 'Uber Green' product. Internal focus groups and roundtables reveal a similar story.

BEUC, the European Consumer Organisation, has shown that European consumers are currently 'locked into a mobility system – centred around fossil-fuelled transport' and that they would be willing to change.[20] However, travelling more sustainably is often less convenient or simply unaffordable for many. Consumers may struggle to make a greener choice even if they would like to. A recent Eurobarometer survey shows that while consumers are ready to switch to more sustainable forms of transport, the main condition for doing so is that it doesn't cost more.[21] Addressing this barrier requires improved access to cleaner modes of transport, but also for governments to use fiscal policy to translate the environmental impact of our choices into price signals. Consumers also need access to information about the environmental consequences of their journeys so that they can make better informed decisions.

Everyone wants better air quality in their local area, particularly near places of critical importance such as schools and hospitals. Consumers also want to reduce their own carbon footprint and limit their contributions to harmful pollution. Travelling sustainably can and should become the easier, more accessible, and most affordable option for everyone.

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19. YouGov survey (2020), Ecology and behaviour
20. BEUC (2020), Breaking out of fossil-fuelled mobility
21. Eurobarometer survey (2020), Mobility and transport

The role of battery electric vehicles (BEVs)

As is recognised across the EU and beyond, there can be no solution to the challenge of damaging transport emissions without eliminating internal combustion engines (ICEs) in favour of zero emission vehicles (ZEVs) in the near future. In this report we focus on battery electric vehicles (BEVs) which run fully on electricity and so produce no exhaust emissions. The broader EV (electric vehicle) term can also include HEVs (hybrid electric vehicles) and PHEVs (plug-in hybrid electric vehicles), both of which have a combustion engine and so can emit CO_2 and other pollutants. Other zero exhaust emission vehicles include those powered by a hydrogen fuel cell. Despite considerable interest, hydrogen vehicles are not yet widely available at the same scale as EVs, and so are not considered in this report.

Crucially, BEVs reduce exhaust emissions of NO_x and several other harmful air pollutants to zero. A full transition to this technology would substantially reduce the harm caused by transport sector emissions by rapidly improving the air quality of Europe's most heavily polluted streets and greatly diminishing a key cause of respiratory health issues. With BEVs also eradicating exhaust CO_2 emissions, it would also significantly reduce transport's contribution to the climate crisis.

A BEV will generate some CO_2 emissions over its life – for instance through the manufacturing, delivery and disposal process and the electricity generation required for charging. However even after taking this into account, a BEV still emits much less overall lifetime CO_2 compared to the average European car.[22] Emissions from production are more significant for BEVs, so the benefit is even greater for vehicles in high use where these one-off emissions can be spread over a longer driving distance. As power generation to fuel BEV batteries decarbonises over time and as BEV technology advances, emissions will be reduced further. Accordingly, while there are already huge environmental benefits to shifting to a BEV, those benefits will only increase over time, as shown in a recent report by Transport & Environment.[23]
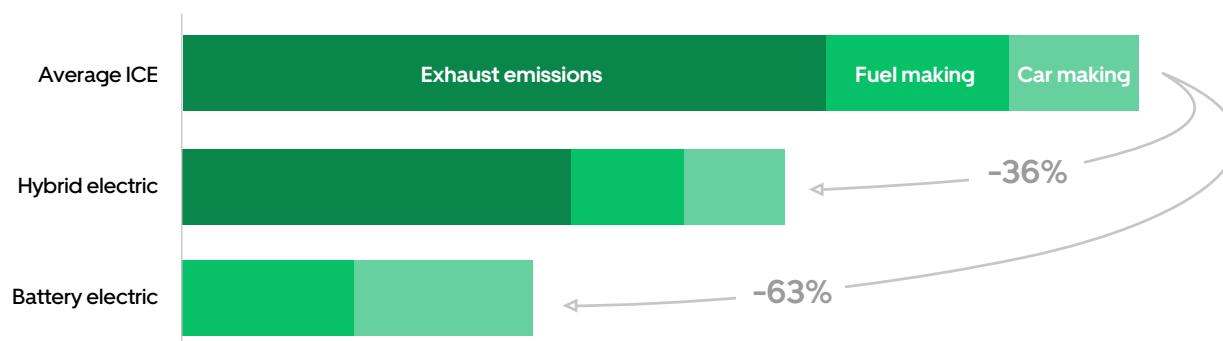
Comparison of lifecycle CO_2 emissions for a car in high-kilometre use

There is a long way to go before ICEs disappear from our roads, and change will need to be delivered at pace. The International Energy Agency estimates that BEVs accounted for 2.6% of global car sales in 2019, and around 1% of the global car stock.[24] Considering that over half of the world's BEV stock is in China, achieving a large-scale shift to BEVs in Europe will be one of the biggest revolutions in the continent's transport sector since private cars were purchased en masse. Presented this way, it may appear that eliminating ICEs is an impossible challenge. Yet we are progressing quickly – in 2010 there were only 17,000 EVs on the road globally, yet by the end of 2019 that figure had risen to 7.2 million.[25]

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22. Carbon Brief (2019), Factcheck: How electric vehicles help to tackle climate change. Used as basis for chart. Analysis adapted for a high use vehicle with 225,000 lifetime kms; and BEV with a 62 kWh battery with an updated production emissions estimate of 75 kgCO₂/kWh
23. Transport & Environment (2020), How Clean are Electric Cars?
24. IEA (2020), Global EV Outlook 2020
25. IEA (2020), Global EV Outlook 2020

We live at a time of ever-faster technological adoption. For example, while it took over forty years for the use of landlines to rise from 10% to 50% of US households, the same penetration was achieved by mobile phones in just 8 years (from 1994 to 2002) and just 5 years for tablet computers (2011 to 2016). With the right consumer and policy environment, the best products are now sought out and adopted more quickly than ever.[26]

Public policy across Europe has recognised the environmental necessity of phasing out ICEs. The European Commission is in the process of reviewing CO_2 legislation for light-duty vehicles in the context of the EU's increased 2030 GHG reduction ambition, and its 2050 climate neutrality objective. The Commission is expected to propose more stringent air pollutant emissions standards for ICE vehicles. The Commission's Sustainable and Smart Mobility Strategy, expected late this year, and the potential revision of the Alternative Fuels Infrastructure Directive, will shed more light on the Commission's approach, but it is clear that BEVs will play an important role.

Many countries are also now setting binding targets for phasing out ICEs. The Netherlands, for instance, has set a target for all new cars to be emission free by 2030, the UK is consulting on banning sales of new petrol, diesel and hybrid cars by 2035 and France will prohibit sales of petrol and diesel cars by 2040.[27, 28, 29]

Country	BEV %		Target dates for ICE bans				
	% stock of all vehicles[30]	% Q1 2020 new sales[31]	2020	2025	2030	2035	2040
Netherlands	1.5%	8.4%		**Amsterdam** Commercial ICE use	**Netherlands** All new ICE sales		
Portugal	0.7%	5.9%	**Lisbon centre** PHV ICE use				
France	0.6%	7.1%		**Paris** Diesel use	**Paris** ICE use		**France** All new ICE sales
UK	0.4%	3.8%		**London** ICE use		**UK** All new ICE sales	
Belgium	0.4%	2.3%			**Brussels** Diesel use	**Brussels** All ICE use	
Germany	0.3%	3.7%					
Spain	0.1%	1.8%					

Action at a regional and local level also recognises the need for BEVs to replace Europe's polluting stock of ICEs. For example, there are proposals for central London to become a zero-emission zone in 2025[32], with access restrictions or charges for ICEs to be implemented for all drivers, while Paris will ban petrol and diesel cars from 2030[33] and Brussels five years later.[34] In some cities, ICE phase outs will apply to PHV drivers even sooner. Lisbon will soon allow only electric PHVs to enter the city's central zone[35], with the measure initially due to be implemented by August 2020 but delayed due to the COVID-19 pandemic.

26. Visual Capitalist (2018), Chart: The Rising Speed of Technological Adoption
27. Ministry of Economic Affairs and Climate Policy (2019), The Netherlands Integrated National Energy and Climate Plan 2021-2030
28. UK Government (2020), Consulting on ending the sale of new petrol, diesel and hybrid cars and vans
29. Légifrance (2019), LOI n° 2019-1428
30. European Alternative Fuels Observatory (2020), Country summaries
31. European Automobile Manufacturers Association (ACEA) (2020), Fuel types of new cars
32. Mayor of London (2018), Mayor's Transport Strategy
33. City of Paris (2018), Paris Climate Action Plan
34. European Alternative Fuels Observatory (2020), Belgium incentives
35. Lisbon City Hall, ZER Avenida Baixa Chiado

Case study: Lisbon's low emission zone

Several European cities have introduced, or pledged to introduce, zero or low emission zones to phase out ICEs, reduce pollution and improve local air quality. These range from road charges for ICEs entering specified zones to outright bans of these vehicles.

Lisbon provides an important early example of an ambitious approach at city level and will provide useful insights into both the positive and negative effects that low emission zones can have on commercial drivers and consumers. Initially due for implementation in mid-2020 (although delayed due to the COVID-19 pandemic), Lisbon's low emission zone would prohibit access to much of the historical city centre for ICEs (except for residents, taxis and other commercial vehicles, which are exempt from these restrictions). What is unusual about this regulation, and particularly challenging for drivers using the Uber app, is its swift implementation with less than one year's notice.

Banning ICEs can come with significant, often hidden, downsides. We believe that such bans are most appropriate when they are applied fairly and equally to all drivers, and when they are used as the final step of a longer process of supporting drivers to electrify. If the right conditions are in place to enable drivers to switch to BEVs many years before a ban takes effect, then cities can avoid placing immediate and sometimes life changing economic costs on individuals, while still reaping the same environmental benefits. Commercial ride-hail drivers and fleet partners face a particularly high cost from such a sudden transition. Some may leave the industry, and those that do not will be forced to discard vehicles at short notice and buy or lease more expensive ones at significant cost.

In Lisbon, Uber has made progress in increasing the use of BEVs and is working intensively to support fleet partners to electrify. In 2016, we launched a 100% electric 'UberGreen' product to give passengers the option to request a trip from a BEV driver. Since then we have partnered with Leaseplan to continuously improve the financial costs of renting or leasing a BEV. In 2019, Uber entered a partnership with Power Dot to lower charging costs and create charging hubs for drivers on the platform, reducing the time spent searching for a charger. From July 2020, all new drivers registering on the platform in the Lisbon and Porto Metropolitan Areas and in most of the biggest Portuguese cities need to drive a BEV.

Uber's efforts are all aimed at improving the economics of driving a BEV versus an ICE, by ensuring that the right conditions and infrastructure is in place, to the extent that we can. We also hope that these actions can help stimulate investment across the overall EV industry. However, conditions in Lisbon are such that the costs of a BEV are not yet competitive with those of an ICE. The short notice would also leave little time to adapt.

Complying with Lisbon's incoming low emissions zone would be challenging and costly. However, we hope that a combination of industry cooperation between commercial fleets, vehicle manufacturers and financing partners, and ambitious public policies can help minimise the social costs of the change.

Nevertheless, in an ideal world a ban would be implemented only with many years' notice, and after the point where the charging network and economic conditions have already been created such that switching is already an economically rational decision for drivers. As such, it would formalise a change that would already be well on the way to completion, and its economic impact would be much more limited.

The role of high-kilometre commercial drivers

High-kilometre commercial drivers - a definition which includes most taxi drivers and ride-hail drivers, but also many others like delivery drivers, some providers of home services and so on - will play an important role in driving BEV adoption and tackling road transport emissions. In all technological revolutions, the path ahead is forged by a cohort of innovating and early-adopting users that demonstrate the feasibility of the change to the whole market. High-kilometre commercial drivers are well placed to form this cohort - because of their heavy vehicle use, they can benefit most from the lower operating costs, provided they can find a suitable vehicle and way to charge. The adoption of BEVs by those users who drive the most will also create economies of scale for BEV manufacturers and strengthen the investment case for the critical charging infrastructure that must be developed across Europe to enable electric transport.
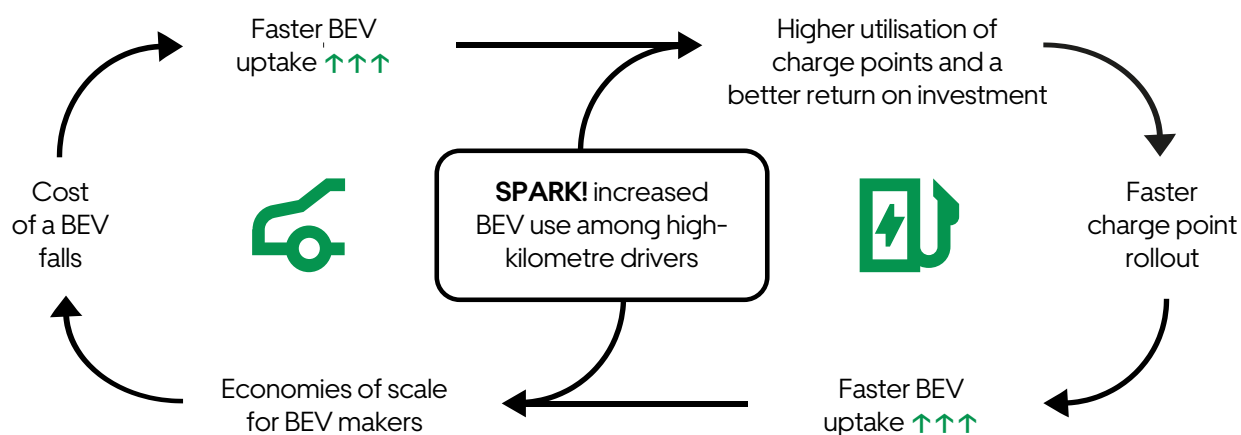
High-kilometre drivers can kick-start BEV uptake across society

There is a strong environmental-economic rationale for focussing attention on high-kilometre commercial drivers. Although small in number, these drivers all drive a lot more than the average person. Promoting electrification among this group will therefore have an outsized environmental benefit, reducing emissions of greenhouse gases and local pollutants.

The average vehicle in the UK travels roughly 12,000 kilometres each year[36], whereas the average ride-hail vehicle might clock up around 45-50,000 kilometres, four times as much, or more in some cases. It follows that the effect of shifting into a BEV will save four times more exhaust emissions for a ride-hail driver than an average driver doing the same. Framed differently, the ride-hail driver shifting to a BEV will reduce emissions by as much in three months as the average driver would in a full year. Clearly, both groups of drivers must make the switch to a BEV, but prioritising change initially among the drivers with the greatest environmental impact should be the policy focus.

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36. UK Department for Transport (2019), Annual mileage of cars by ownership and trip purpose: England, since 2002

Private driver	Commercial driver	Increased benefit
~12,000 km	~48,000 km	**~4x**

When governments look at ways to most efficiently deploy environmental incentives, the emissions reduction benefit that can be attributed to each Euro spent on subsidy could be even more than 4x greater for high-kilometre commercial drivers than for the average driver. This increased benefit stems from two factors. First, high-kilometre commercial drivers are overwhelmingly likely to use their new BEV for all of their travel, whereas a large proportion of ordinary drivers may use it as a second car. Subsidies for ordinary drivers will not therefore eliminate all their polluting kilometres. Secondly, being particularly cost-conscious, high-kilometre commercial drivers are more likely to change their behaviour as a direct response to the subsidy. Without it, their commercial case does not stack up.

With the right commercial frameworks and a supportive policy environment in place, high-kilometre drivers can dramatically reduce their own emissions and anchor a wider shift to BEVs across the market as charging infrastructure is built around them and the economics of shifting to a BEV improve for other drivers too.

Chapter 2
Uber's progress

Ride-hailing, in its modern, app-based form, is a relatively new phenomenon. Uber first started offering ride-hailing services in 2011. Since then, the growth of the industry has been rapid, and Uber itself now operates in more than 66 countries globally.

Uber's business in Europe

Operates in 23 countries

Multiple transport modes are available in the app. Depending on the city, this can include passenger cars, e-bikes, e-scooters, e-mopeds, car rentals and public transport, among others

More than 400,000 drivers provided rides using the app in 2019

33 million passengers took a ride in 2019

Over the last decade, ride-hailing services like Uber have played an important role in the transportation landscape. Where these services are available, users, at the touch of a screen, can access safe, reliable, on-demand transportation at all times of the day and night and in more places than ever before. Its convenience, coupled with simple, trusted methods of payment, has altered the way that people in towns and cities move around. The ubiquitous nature of ride-hailing has helped increase the effectiveness of public transport systems by filling spatial gaps (first/last mile) and temporal gaps (times with no or reduced service). Most importantly, these services have shown that it is possible to reduce reliance on the private car - a severe problem faced by most modern cities all around the world.

Ride-hailing provides many benefits, but there are trade-offs to consider too, particularly around the potential impact of ride-hail services on traffic and the environment. The direct and indirect impact of ride-hailing in these areas and on the wider transport system is an active area of research and subject of some debate, but for Uber, minimising any such externalities from the service is a key strategic priority. Over the last decade we've made significant progress, but there is also plenty more to do. We are excited to partner with cities to help unlock new forms of transportation for citizens while improving the environmental footprint of the entire industry.

Uber's role in the taxi and private hire industry - using technology to make better use of cleaner vehicles

The taxi and private hire industries have always consisted of a relatively small number of vehicles driving a large number of kilometres in providing an essential complementary transport service to passengers and cities.

Regulatory and operational distinctions aside, the common challenge all such services face in bearing down on transport emissions is simple - to work out the most environmentally efficient way to transport a passenger from A to B.

New technologies, like those offered by Uber and others, can help improve the environmental impact of this centuries old industry. While this report focuses on the transition to BEVs and cleaner vehicles, ride-hailing technology can contribute to reducing the emissions from a trip in each of three key areas. Here are some examples of what has been done so far:

1. Cleaner vehicles

In cities across the globe, drivers using the Uber platform have often embraced the switch to hybrid vehicles faster than the general population. Since they drive long distances, ride-hail drivers have more to gain by keeping fuel costs low even at the cost of a slightly more expensive vehicle. Many drivers on the Uber app are therefore using newer and cleaner vehicles than the private markets they operate alongside. In London, for instance, more than 50% of kilometres on Uber are in hybrid vehicles.

We also know that some passengers want to be able to make active environmentally-conscious choices. The **Uber Green** product allows passengers to request a trip from a driver with a cleaner car. Uber has launched its Green option in 37 European cities to date, of which 20 include only BEVs and ensure a fully electric journey.[37] This allows passengers to make a greener choice, while providing new business to drivers of the cleanest cars.

We have also integrated a range of other transport options into the app, including **micromobility** services like e-bikes, e-scooters and e-mopeds. These small, personal, electric vehicles are great for shorter trips, and help reduce car trips and associated emissions.

2. Increasing occupancy

Technology also opens up new ways to help more people share the same vehicle, thereby reducing the carbon and congestion footprint of each passenger. These are major concerns for any mode of transport where a vehicle is procured on an individual basis, including both ride-hail and traditional taxis as well as private cars.

To enable more sharing we created **Uber Pool**, which allows passengers traveling in the same direction at the same time to share a car. By getting more people into fewer cars, we can achieve higher efficiency of use for cars on the Uber app.[38] Each passenger travels at a cheaper rate when compared to a normal Uber ride, incentivising better use of finite transport capacity. Uber Pool is currently suspended in support of public health efforts to tackle COVID-19, but previously 20% of all trips were Uber Pool trips in cities where it was available.[39] Every day, sharing rides on Uber Pool saved one million miles versus the same number of rides on the standard Uber service - two trips to the moon and back.[40] To further reduce individual car trips, we recently started piloting **Non Stop Shared Rides** in some US cities. This gives a passenger on a regular trip the option to instead join a shared trip, but with the guarantee of being picked up last and dropped off first. This means they can still travel directly to their destination as on the regular service, but by sharing the car with others they can still reduce emissions

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37. While we want to offer a BEV only product in as many places as possible, in some situations it can actually backfire for both passengers and drivers. In the remaining 17 cities, hybrid EVs are currently included as the more limited number of BEV drivers available could result in longer wait times for passengers and a large volume of cancellations, harming customers' perceptions of the service, causing frustration and potentially even lower earnings for BEV drivers
38. Uber marketplace, How does UberPool expand access?
39. Uber Newsroom (2018), Introducing UberPool: A New Way to Share
40. Uber marketplace, How does UberPool expand access?

even when they are in a rush, as an extra car is no longer needed. We have also launched **Uber Bus** in Cairo, Kiev and Monterrey, allowing Uber users to reserve a seat on a comfortable, safe, and convenient commuter service.

Uber Pool is an important example of how technology can enable more sharing of transport. But to reduce private car usage and ownership, we need to increase the transport options each Uber user is able to access. Uber's mission is to become a multimodal transportation platform. We have partnered with cities and transport agencies to make **public transport** - the backbone of any city's transportation system and the ultimate high occupancy vehicles - more accessible and easier to use by providing information, directions and even ticketing through the Uber app in certain cities.[41] Users can now make an informed choice between a private hire trip or a number of other options like a scooter, bike, bus or train.

3. Reducing empty kilometres

Helping taxi and private hire drivers to make more efficient use of their vehicles - with more passengers and fewer empty kilometres - is another vital lever to reduce the environmental footprint of the service. Uber's technology can improve utilisation beyond what was previously possible, addressing a concern that has always plagued the traditional street hail industry - time spent driving empty. This means drivers using the Uber app can spend less 'unproductive' time on the road, with fewer emissions while waiting for trips or making pickups.[42]

Over the years Uber has developed a range of cutting edge technologies to improve how it matches passengers and drivers through the **Uber marketplace**. Traditional street hail services rely on serendipity to find a match, with drivers cruising around to stay visible and moving to new places where experience suggests the odds of finding a passenger are higher. As with many areas of life, technology can help. Drivers can now connect with passengers around the corner as well as those right in front of them; and can be smartly matched with passengers in a way that is better for them and for the system as a whole, rather than relying on chance contacts between individuals.

On Uber, a passenger is not simply matched with the closest driver. In the seconds after a request is made, Uber analyses routes and real time traffic, as well the whole range of possible matches that could be made across batches of passengers and drivers, to find combinations of trips that are better for everyone. Every day, across Uber, this process of 'batched matching' saves 10 years worth of people's time and countless wasted kilometres. These kinds of approaches are only possible with ride-hailing technology and, by finding better matches, they are key to reducing the time that drivers spend driving around empty on city streets.[43]

On an **Express Pool** trip, for instance, passengers are asked to walk to a nearby pickup location so that they can share a car. These matches are optimised based on analysis and prediction, meaning more matches, smoother pickups and a more direct route, reducing the impact of these trips on the environment. It also means a higher chance of further matches along the way, enabling more back-to-back trips where drivers can keep earning uninterrupted, and where wasteful downtime between passengers - so common in traditional street hail work - is eliminated altogether.

These marketplace technologies continue to improve. Information and price signals given to drivers in the app help them understand when and where to go - or stay - to get a new trip quickly and minimise the time they spend driving empty. In some cities drivers can accept the next ride before the end of their previous trip; in others, when drivers want to stop driving they can now request a trip ending close to their home instead of driving home empty. This gives drivers the option to keep earning all the way home, while continuing to reduce empty kilometres driven, a win-win for both drivers and cities.

Uber's vision for the industry is that by using technology, any volume of trips can be handled as efficiently as possible with fewer drivers, driving fewer kilometres, in cleaner cars. This is good for drivers who stay busier, passengers who pay less, and for cities by reducing congestion and emissions from each trip as compared to incumbent, serendipitous approaches without the benefit of technology. In this way we are committed to continually trying to reduce the environmental footprint of a trip, and to raising standards across the industry as a whole.

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41. Mass Transit (2020), Uber Transit launches in Ohio and Kentucky
42. Cramer and Krueger (2016), Disruptive change in the taxi business: the case of Uber
43. Uber marketplace, How does Uber match riders with drivers?

The road ahead...

Though we've made considerable progress over the last few years, we know we can do more to reduce the environmental impact of trips that are enabled by the Uber app. It is clear that electrification is the next big priority for Uber, and we are focused on the role we can play in driving mass adoption of battery electric vehicles, not only on our platform but in wider society too.

Case study: Uber's Clean Air Plan in London

Making big bets on electrification

Since arriving in London in 2012, Uber has become an important part of the city's transport system, offering Londoners a variety of safe and reliable ways to get around the city. Our main service sits alongside more recent additions such as eBikes, Uber Boat and public transport options.

Over 50% of the kilometres travelled in PHVs on the Uber app in London today are already in a hybrid electric vehicle. But we want to go further. **Our ambition is for every PHV trip on the Uber app in London to be in a battery electric vehicle by 2025.**

London policymakers have already put in place a number of incentives that help encourage that switch. The current BEV exemption from London's Congestion Charge Zone levy, for example, goes some way to redressing the cost differential between ICE and zero emissions vehicles. But the reality is that BEVs are still an unaffordable option for most drivers. BEVs, as an emerging technology, are more expensive to purchase. This is especially true given that most drivers on the Uber app in London opt for used cars where they can. Unfortunately the used BEV market in the UK is still nascent.

In addition, while the Mayor, London Councils and individual boroughs have targeted investment in charging infrastructure in recent years, a report by the Energy Saving Trust into a BEV trial run by Uber showed that significant further investment in infrastructure is needed to accelerate the uptake of BEVs in London.[44] To make electrification a reality, Uber, carmakers, charging companies and public bodies all have a vital role to play in making BEVs more viable and affordable.

Uber's contribution

Uber is committed to working with drivers to help them overcome the current barriers to BEV adoption. We launched our **Clean Air Plan in 2019**, in which a Clean Air Fee of 15p/mile is added to every trip. These funds are then used to support existing BEV drivers with their operating costs or assist current ICE drivers to transition to a BEV.

The plan has so far raised over £100 million, and is expected to raise hundreds of millions in total. This helps drivers reduce the upfront cost of a BEV by an average of £4,500, in addition to existing government subsidies and incentives. Any left over funds will be used to pay for Clean Air initiatives in London.

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44. Energy Saving Trust (2017), Electric Private Hire Vehicles in London

Forging new partnerships

Beyond what we can do directly ourselves, we also need to work extensively with partners to make BEVs viable. To that end, we are working with vehicle manufacturers to make BEVs more affordable. A deal launched earlier this year between **Uber and Nissan** made 2,000 electric 40kWh LEAF vehicles available to drivers at a competitive price. This is an important start, but many drivers are looking for longer range BEVs and such models are more expensive, especially when compared to their ICE equivalents.

We have also launched a partnership with **BP Chargemaster** - the UK's leading charge point operator for electric vehicles. This is designed to ensure that drivers have reliable, affordable access to all forms of charging, whether at home or across the city. From later this year BP will be rolling out hubs in key strategic locations across London to complement those already delivered by the Mayor, London Councils and individual boroughs, including dedicated Uber chargers.

Finally, we know that we have a responsibility to use our experience to ensure charging infrastructure coverage meets the demands of everyone. To this end, we have joined forces with world-leading companies such as Centrica, Royal Mail, and Hitachi to participate in the **Optimise Prime** trial. This project, part funded by Ofgem and Innovate UK, is the world's largest commercial BEV trial and will help ensure charging infrastructure is available where it is needed, in the right quantities without putting stress on the grid.

Progress so far

Since the launch of our Clean Air Plan, almost 1.5 million Uber journeys have taken place in BEVs, representing 7.5 million zero emission miles. BEV penetration amongst drivers using the Uber app in London is currently over 5x the UK wide average. This is a great start and Uber is committed to going a lot further. We would like to help many more drivers move to BEVs, and to work together with boroughs and charging companies to accelerate the rollout of charging infrastructure that all Londoners can benefit from. With the right partnerships and policy environment we are confident we can help significantly improve air quality in London.

Chapter 3
SPARK! Uber's commitments to electrification

We recognise that Uber must do more to bring about greater decarbonisation and cleaner, safer cities.

Our efforts are designed to make a key difference in two vital ways. First, we intend to reduce to the lowest possible level the emissions from vehicles on the Uber app. Second, by our actions we want to help underpin the wider transition to BEVs amongst all drivers, by actively contributing to improving the economics, providing practical support, and improving public sentiment for the phase out of ICEs.

These commitments are ambitious and will require a step-change in our activity, but we are determined to deliver them and **SPARK!** electrification across Europe.[45]

Our commitments

Uber will

Switch to become a 50% electric rides platform by the end of 2025 on an aggregate basis across seven European capitals - Amsterdam, Berlin, Brussels, Lisbon, London, Madrid and Paris

Uber will move significantly ahead of the market in the transition to BEVs, creating the right conditions for drivers on the platform to go fully electric on all passenger trips well before long range BEVs reach price parity with ICEs.

Uber does not own vehicles and drivers make their own decisions; but Uber can help encourage drivers to electrify, in part through our own actions, but also through engaging with governments, cities and other companies. We intend to accelerate our work with charging companies, vehicle manufacturers and financing companies to alleviate bottlenecks to BEV adoption; to provide more information to drivers to ensure that they are well-placed to make the best decisions for them with respect to BEVs; and to launch more green products to stimulate and capitalise on consumer demand.

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45. Including, for the purpose of these commitments, the EU27, Norway, Switzerland and the United Kingdom

Since conditions in each city are different – for instance the availability of charging infrastructure and purchase subsidies for BEVs – we will assess our performance at a pan-European level across these seven capitals. In some we expect that much more than 50% of kilometres driven will be fully electric, while in others that percentage will be lower. This also reflects the significant impact that national and local regulations can have on the ability of drivers on the platform to move to a BEV. These differ from city to city and can help or hinder the switch. Due to the compounding way in which new technologies are adopted, we will add many more BEVs to our platform in the second half of the period than the first, but we are already building the groundwork to accelerate rapidly each year as we move closer to 2025.

To hit our ambitious targets, we will need to move swiftly in whichever cities create the best conditions for BEV driving. As our second commitment will show, we welcome the opportunity to go further, faster, together with any city that wants to explore policy and infrastructure measures to make it easier for drivers to switch to a BEV.

Uber will

Partner with any major European city to offer 100% electric rides within 5 years once the economic and policy conditions are in place such that drivers will be no worse off in a BEV than they are in an ICE today - entirely eliminating the use of emitting vehicles

Drivers are at the heart of the service and Uber will always do right by them. Making sure that switching to a BEV is in the best interests of drivers will require cities, ride-hail companies, carmakers and charging providers to work together. That is the only way to tackle the key barriers that currently prevent many drivers from electrifying.

Drivers are independent and they choose the car they want to drive. In order for a driver to electrify, the total cost of ownership (TCO) of a BEV must be competitive with an ICE (see **Executive Summary: What is TCO?**). As we explain in Chapter 4, we believe that this will happen once:

• Drivers can access reliable and affordable overnight charging at or near their home
• Drivers can access affordable / second-hand BEVs that can drive a full day on a single charge
• Any remaining TCO differences after these conditions are in place are mitigated by financial incentives

Uber wants this commitment to be meaningful and measurable, so we will work with an independent environmental NGO to objectively compare all the costs drivers who use our app face when driving in a BEV versus the most cost effective ICE today. This will highlight current TCO differences, and lead to a forecast as to when cost parity might be achieved for different types of drivers in different cities - thereby starting the clock on our 5 year commitment - as well as highlighting policies that could accelerate the path to this crucial milestone. Importantly, the clock will start for different types of drivers at different times, depending on the unique circumstances affecting each group.

Ensuring that BEV drivers will be no worse off than today is key to a just and fair transition. Responsibility for reducing CO_2 - for the benefit of all society - should not fall disproportionately on one group. Many ride-hail drivers have invested a significant sum in their vehicle which they are continuing to pay back. Now they face the prospect of obtaining an expensive BEV years - or even decades - earlier than some much wealthier consumers. While it is of course appropriate to focus attention on drivers, like those in ride-hail, who drive long distances in cities, it is also vital that overall costs for such drivers, measured on a TCO basis, remain similar to today so that drivers can still make a good living.

This also matters because ride-hail drivers operate in a highly competitive industry. If they cannot offer an equally affordable, convenient service in a BEV, then passengers will quickly turn back to cheaper, polluting alternatives such as their private ICE vehicle. BEV mandates or ICE bans without accompanying efforts to improve the economics of BEV driving will not only harm ride-hail drivers themselves. By shifting passengers away from the sector as a whole, it also risks negating the environmental benefits that shared, electric ride-hail vehicles can offer cities by transporting a large number of passengers in a relatively small number of clean vehicles.

Achieving the conditions for an effective transition to BEVs - and then making it a reality - will take time. As such, five years after these conditions have been met in a given city, Uber will not permit any vehicles with exhaust emissions to offer rides on the Uber app. The conditionality and timing of this commitment is critical - drivers (and fleet partners) are skilled in knowing when to change their vehicle to maximise their earnings. But it takes time to pay off a vehicle loan, and to have the means and opportunity to upgrade to a new car. By the time a driver looks to do so it must make financial sense for them to choose a BEV. That is generally not the case today, and it will take bold action by industry, cities and governments working together to make BEVs cost competitive. It is simply not possible to fully electrify in Europe without changes in the external environment, particularly around charging.

To ensure that our work has the greatest overall impact on CO_2 it makes sense to focus first on major cities. We intend for this commitment to apply in any of the 20 European cities in which Uber has the largest business, which together represent around 80% of all kilometres driven on Uber in Europe.

Uber will

Advocate publicly for inclusive policies on charging, vehicles and incentives to accelerate BEV adoption among high-kilometre commercial drivers and the wider public

When it comes to understanding the pros and cons of different BEV and ICE models, drivers are the experts. By listening to drivers, Uber has been able to build an excellent understanding of the day-to-day reality of driving a BEV on Uber; as well as the barriers faced by the large majority of drivers that haven't yet made the switch.

Likewise, through participation in industry groups and work with NGOs, vehicle manufacturers, charging companies, grid operators and cities, Uber has learned a lot about important external challenges. These include, but are not limited to, the challenges inherent in expanding access to affordable, on-street, normal and rapid charging infrastructure to satisfy growing driver demand; and making, distributing and financing new and second-hand BEVs for drivers in a cost competitive way.

One thing we have clearly learned is that we cannot work alone. The only way that we can deliver on our electrification commitments is through a clear-eyed understanding of what we can and cannot do ourselves and, in the latter case, partnering with other companies and public bodies in pursuit of a shared goal. We believe that enabling zero emission transport across society is a moral imperative, and we aspire to be an active voice in the policy debate; as well as a constructive partner to drivers, cities, governments, the transport industry and society at large as we all learn together how best to accelerate this vital transition.

Uber will

Report publicly on improvements in CO_2 emissions per kilometre driven on the Uber app

Uber is proud of many of the innovations we have brought to the taxi and private hire industry, but it remains extremely difficult for policymakers and the public to reliably assess and compare the impact of different companies' and drivers' activities on the environment.

Tackling this issue is essential for consumers to make informed choices, to guide policy, facilitate investment and maintain the public awareness needed to push for change. Uber will play its part by being transparent in sharing emissions intensity data from aggregated passenger rides. Over time we will look to continually enhance and improve this data so it is as useful as possible to passengers, drivers and cities.

Our work will begin with the publication of data from a subset of European cities, which we will release in 2021.

Uber will

Keep expanding sustainable options in the Uber app:

- **Expand 'Uber Green' from 37 cities today to 60 by the end of next year, offering a cleaner option to passengers across ~80% of our European business**

- **Further expand our offering of e-bike / e-scooter / e-moped options beyond the 20 cities where they are available today**

- **Seek to partner with cities and transport agencies to expand our public transport journey planning service from 3 cities today (London, Paris & Lisbon) to 25 within five years**

Our 'Uber Green' product allows users to request a journey in a BEV or a hybrid EV, enabling them to consciously address their carbon footprint and providing additional business to BEV and hybrid drivers on the platform.

To date, Uber has launched this product in 37 European cities, of which 20 include only BEVs and ensure a fully electric journey. In the remaining 17 cities, hybrids are currently included given that the limited number of BEV drivers available would result in long wait times for passengers and longer distances for drivers to pick up passengers. Once a critical mass of BEV drivers has been reached in those cities it will also become fully electric.

Uber also has an important role to play in encouraging individuals to take even cleaner modes, such as public transport. Passengers often use Uber to address gaps where public transport is not available – for instance the first and last miles of journeys - or at times when public transport is not an option. This reduces the need for private car ownership and keeps riders within the multimodal ecosystem. On a given journey, however, there are certainly many situations where taking public transport, a bike, a scooter or walking is equally or more efficient than travelling by car, and so we want to offer these options too, so that riders can make an informed choice.

Uber would therefore like to work with at least 25 European cities to launch public transport journey planning in the Uber app by 2025, helping users conveniently compare ride-hail options with travel by bus, metro or train. Uber will also continue to bring e-bikes, e-scooters and e-mopeds onto the platform in more European cities, to offer active options for short journeys.

In taking these actions, we will ensure that individuals are able to make better choices about the trips they take, with cleaner options available for every type of journey.

Chapter 4
The barriers to change

Across the continent interest in BEVs is growing. Uber survey data from France shows that among drivers looking to purchase a new car within the next 2 years, 25% are looking to buy a BEV.[46] Our experience in London and surveys of drivers across the city have shown that three quarters are interested in shifting to a BEV.[47] Notably, it seems this interest is greater than that expressed by the general population, suggesting that ride-hail drivers are well-placed to form the vanguard of the European shift to BEVs.[48]

How interested are you in moving to an electric vehicle?

How likely, if at all would you be to ever consider purchasing an EV, if it was available at a price you would consider reasonable?

Drivers on Uber

General population

● Very ● Fairly ● Not very ● Not at all ● Don't know / already have
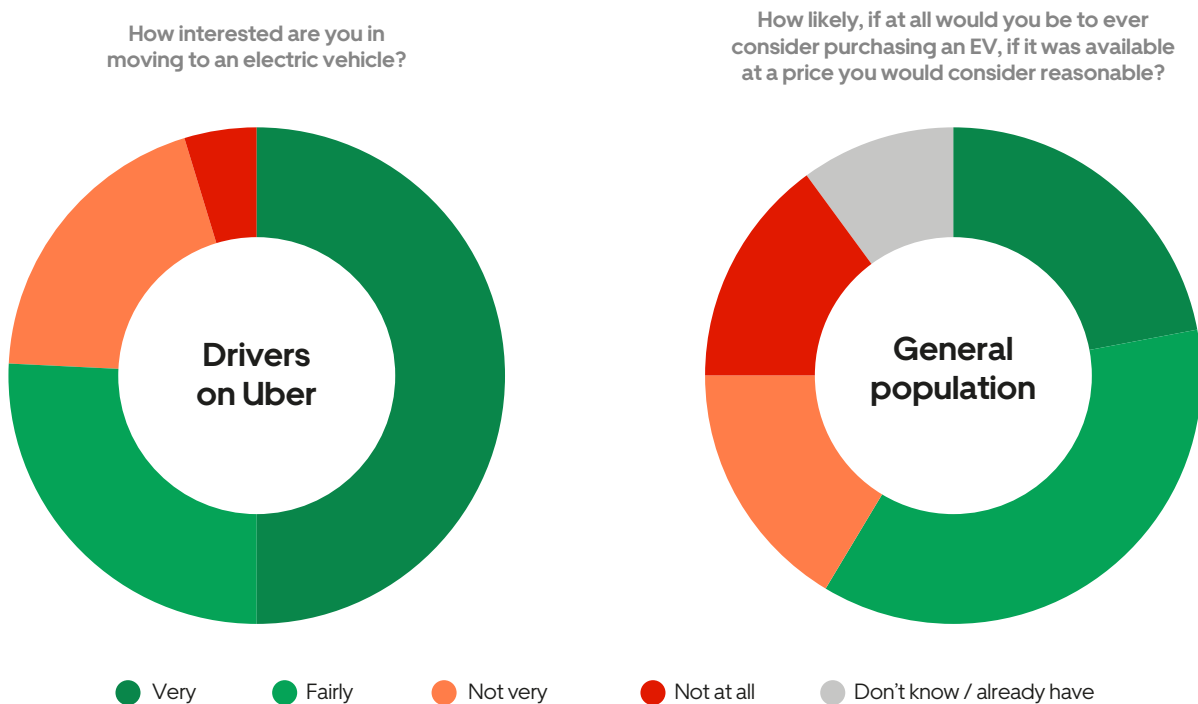
So why is significant ride-hail driver interest not translating into a greater adoption of BEVs? The answer lies in TCO - the total cost of owning and operating a vehicle (see **Executive Summary: What is TCO?**).

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46. Uber survey data
47. Uber survey data
48. YouGov on behalf of Aviva (2019), Executive Summary – Car Survey

Today the TCO of a BEV is normally higher than that of the best ICE options available. Drivers are price conscious, skilled in tracking their costs in great detail and generally prefer vehicles with a low TCO. Unless drivers' assessments show that the TCO is lower for a BEV than it is for an ICE, switching will not be a rational economic decision and BEV adoption will be limited.

There are three core drivers of the TCO gap between a BEV and an ICE, which combine to both raise the cost of acquiring and operating a BEV and to reduce revenue, ultimately lowering take home pay for drivers. They are:

1. **The lack of appropriate charging**

2. **The lack of affordable / second-hand BEVs**

3. **Insufficient financial incentives to close the interim cost gap** (after the first two barriers have been taken into account)

TCO matters. The barriers above put pressure on driver earnings from both directions. The lack of appropriate charging means time off the road, reducing a driver's income. Meanwhile, the lack of affordable / second-hand BEVs increases drivers' vehicle acquisition and financing costs; and though these impacts can be partially offset by financial incentives from government, it is rarely enough to fully close the gap, as demonstrated below.

In an ICE	Costs	Net earnings	
	Total revenue		
In a BEV	Costs may rise	Potentially lower earnings	Revenue may fall due to time spent charging
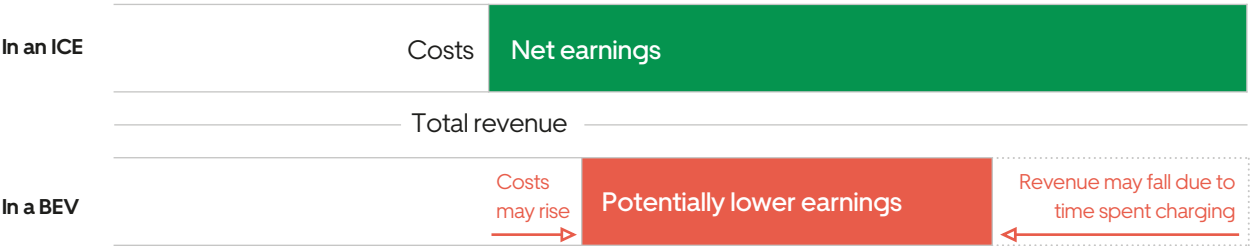
Barriers can put pressure on a driver's earnings from both directions

Barrier 1: The lack of appropriate charging

The single most important issue driving the current TCO gap revolves around charging infrastructure. As well as the upfront cost, commercial drivers are focused on keeping the ongoing costs of operating a vehicle at a minimum. Indeed, our engagement with drivers that use the Uber app has shown that they place significant weight on the cost of fuel, charging, maintenance, insurance and so on. Though it can vary widely, charging is generally cheaper than petrol or diesel fuel, and in theory running costs should be lower for BEVs. However crucially, and uniquely for commercial drivers, the lack of sufficient charging can dramatically increase the cost gap for BEVs by increasing a driver's **opportunity cost**.

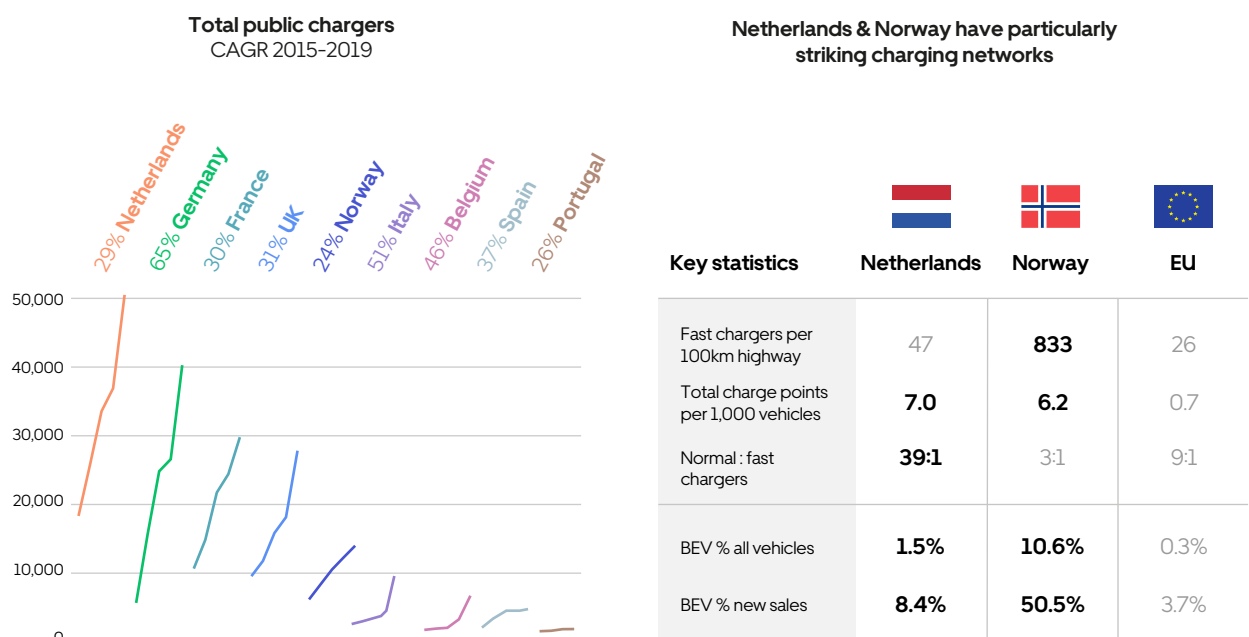The opportunity cost of charging is a key component of a commercial drivers' TCO assessment, which is mostly absent from an ordinary consumer analysis. It is the consideration of lost earnings incurred during time spent looking for and using a charge point (or in the case of an ICE, a garage to refuel). Opportunity cost is strongly influenced by the number, type and location of charge points.

The number of charge points

Charging infrastructure across Europe has expanded rapidly in the past five years. The number of public chargers in Germany, for instance, increased by an average of 65% year-on-year between 2015-19. The Netherlands, the European leader in slower charging infrastructure, has also seen continued 29% year-on-year growth in the same period despite starting from a higher base. Norway, the global leader in overall BEV adoption, also continued to grow its network at pace with a particular focus on fast charging.[49]

Total public chargers
CAGR 2015-2019

Netherlands & Norway have particularly striking charging networks

Key statistics	Netherlands	Norway	EU
Fast chargers per 100km highway	47	**833**	26
Total charge points per 1,000 vehicles	**7.0**	**6.2**	0.7
Normal : fast chargers	**39:1**	3:1	9:1
BEV % all vehicles	**1.5%**	**10.6%**	0.3%
BEV % new sales	**8.4%**	**50.5%**	3.7%

However, this impressive growth pales in comparison to what will be needed in the future. According to Transport & Environment, there will be a need for 1.3 million public charge points across the EU by 2025 and close to 3 million by 2030 – a giant increase when set against the 185,000 that were in place by the end of 2019.[50] This will require a decade of sustained ~30% annual increases in installed chargers on an ever larger base.

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49. Text and image: European Alternative Fuels Observatory (2020), Charging Infrastructure Statistics. Charger growth data in chart is over period from 2015-19. Table data is from 2020.
50. Transport & Environment (2020), Recharge EU: how many charge points will Europe and its Member States need in the 2020s

The type of charge points

Not only must the number of charge points increase dramatically in absolute terms, it is vital that they are of the right kind. For commercial ride-hail drivers, that means more comprehensive provision of overnight, on-street public charging. These must be at least 7kW, but ideally 11kW or more, to ensure that they can fully charge any type of BEV overnight. This rules out many 3-5kW chargers integrated into street lamps which will typically not be fast enough to charge larger battery vehicles overnight.

When	How	Where	Why	Typical speed	Typical time	Typical cost
Main daily charge	**Home**	Private garage or driveway	Typically the best charging solution - cheap, convenient, no loss of earning time, and protects the battery. However many ride-hail drivers don't have off-street parking like a driveway or garage where they can install such a charger	3-11kW	6-30 hrs	Cheap
	Overnight	Near home on public street Shared public or private car park	Slow overnight charging near home on a public street or in a shared car park is the next best option as it also means no loss of earning time. Wide coverage is vital as drivers must be able to reliably find and use a charger a short walk from home so that they don't have to make a special trip to charge	7-22kW	3-12 hrs	Varies
	Rapid	Near home on public street Arterial roads	Where there is a lack of sufficient on-street overnight charging, drivers have to make a trip to a rapid charger for their daily full charge. This means time off the road that they could otherwise spend earning			
Top up charge	**Rapid**	City centre Airports Major destinations	Drivers may also need to top up at rapid chargers during their day, especially if they have a smaller battery vehicle. This means more time off the road, but preferably not too far out of their way, so chargers in the city centre or at airports and other major destinations are preferred	50kW	45-75 min → 80% charged	Expensive

Each different type of charge point meets different needs, and an effective charging ecosystem relies on a healthy mix. Uber is working with charging companies across Europe to expand the provision of all formats of charging infrastructure and engaging with drivers to ensure that we accurately reflect their needs in those discussions.

Through this sustained collaboration and engagement, we have found that in many cases the optimal charging solution for ride-hail drivers (and many other high-kilometre commercial drivers) is to have the option to charge overnight, at or near their home. While rapid charge hubs are great for top ups, they can be markedly more expensive and still require the driver to be idle for 45-75 minutes or more for a larger battery vehicle – a significant period that could otherwise be spent carrying passengers. This can certainly worsen the economics of a BEV, when an ICE driver could use that time to continue to earn. Some drivers will be able to adjust their routine to combine charging with breaks, but not everyone will be able to or want to. Rapid charging tends to be at hub locations that

require a special journey, so it matters a lot whether that location is one where a driver would realistically want or need to take a break.

When charging overnight at or near their home, all those concerns disappear. Drivers can enjoy their leisure time as normal, knowing that their car will be charged and ready to earn whenever they want to start work. Overnight charging is also often cheaper and it tends to be better for the battery. It also allows a driver to charge right up to 100%. Rapid charging can slow down significantly above ~80%, so many drivers won't rapid charge the entire battery, reducing their effective range.

For those drivers with a large battery, an overnight charge will almost always be sufficient to complete a full day, enabling them to eliminate the opportunity cost of finding and using public rapid chargers during the day. We estimate that without overnight charging, drivers can face an additional opportunity cost of >20% of their daily revenue if they can't combine charging with their normal breaks. This problem will be even more acute for drivers with short range BEVs.

Charging time as a % of earning time		Potential driving pattern
Overnight charging available	Long range BEV	0%
	Short range BEV	14%
Only rapid charging is possible	Long range BEV	21%
	Short range BEV	29%

Earning time — Finding charge — Time charging — Breaks
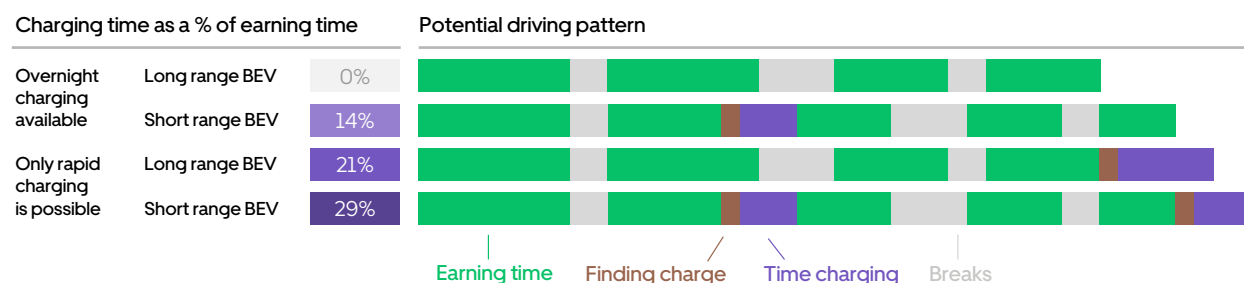
The location of charge points

As well as the number and type of charge points, location matters. The supply challenge is particularly prevalent in densely populated urban areas where the real estate needed to locate and power chargers is most scarce and expensive.

To date, public charging infrastructure has clustered in wealthy areas, consistent with the fact that most BEVs are expensive and so have been sold to better-off consumers. Yet BEV owners in these areas are also more likely to have off-street parking where they can install a private charger. High-kilometre commercial drivers face a different situation. They are less likely to reside in wealthy areas with the best infrastructure and are therefore less likely to have reliable access to public chargers. Many drivers also live in rented houses, terraces or apartment buildings rather than larger detached houses, which means they are less likely to be able to install a private charger in their own off-street parking space.
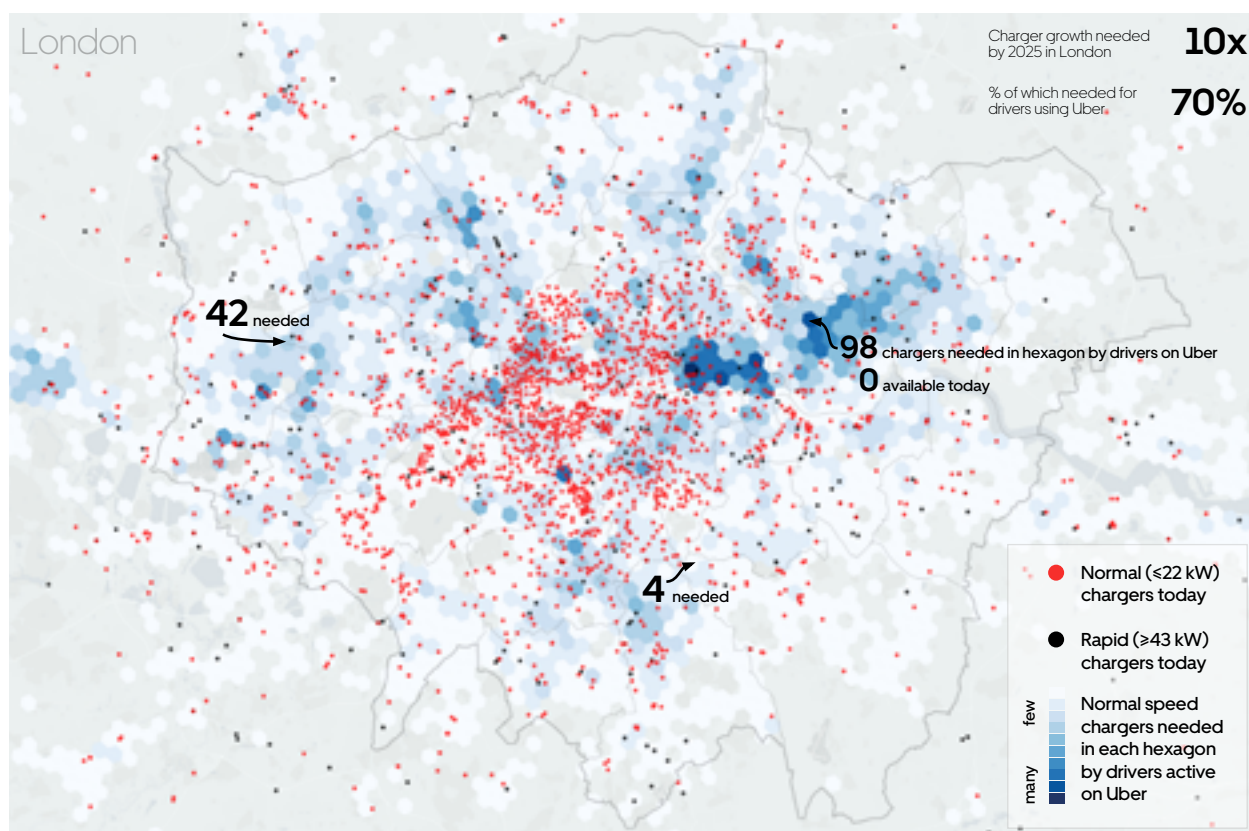
Typical ride-hail BEV driver	Typical consumer BEV driver
BEV is their primary or only vehicle	Likely to own another vehicle, typically an ICE
Needs to charge fully every day	Needs to charge only every few days
Rents an apartment and parks in a shared car park or on the street	Owns a house with a private drive or garage
Lives in an area that is less well served by public chargers	Lives in an area with good access to public charging infrastructure
Depends on a public 7/11kW charger being reliably available near home, each night	Mostly uses a private charger at home. Uses a 50kW public rapid charger occasionally for top ups
Faces an opportunity cost from lost earnings if they cannot charge overnight or during breaks	No lost earnings from time spent charging

This inability to charge reliably and cheaply near their homes imposes a significant extra barrier for high-kilometre commercial drivers when they explore moving to a BEV. The resulting uncertainty as to when and where to charge can make owning a BEV a stressful and economically challenging option, reinforcing and compounding the decision to stay with an ICE.

London provides a valuable illustration. The greatest number of charge points in the city can be found in Westminster which, while including some low income areas, has the third highest median salary of any London borough. Yet the greatest concentration of drivers using the Uber app reside in Newham in East London, the borough with the second lowest median salary.[51] As shown by the map below, if drivers on Uber were all to use BEVs, then overnight charger demand would be highest in East London, which is poorly served by public charging infrastructure when compared to other parts of the city. These drivers are also less likely to have access to off-street parking or the ability to install a home charger. As a result, overnight charging may not be a viable option for these drivers, and switching to a BEV will likely mean that their only option is to use rapid charge points during the day. This puts downward pressure on their earnings due to the opportunity cost of time spent charging.

51. London Datastore, Average Income of Tax Payers, Borough

London

Charger growth needed by 2025 in London **10x**

% of which needed for drivers using Uber. **70%**

42 needed

98 chargers needed in hexagon by drivers on Uber
0 available today

4 needed

● Normal (≤22 kW) chargers today

● Rapid (≥43 kW) chargers today

few — Normal speed chargers needed in each hexagon by drivers active on Uber — many

Drivers on Uber will need many times more chargers, and in very different places to today

In 2025 under one official scenario for BEV growth in London - where Uber is 100% electric - the city will need around 10x more overnight chargers in residential locations. Of those, around 70% would be needed by private hire drivers using the Uber app, who will be electrifying significantly ahead of the city as a whole.[52] Beyond 2025, since Uber will already be fully electric the percentage will then start to fall as BEVs become a larger and larger part of the overall fleet of 3 million vehicles owned by Londoners.[53] This 'pump-priming' of charging infrastructure is just one example of how a small cohort of ride-hail drivers can help establish fertile conditions for a broader societal shift to BEVs.

When comparing the scale of BEV driver demand to the number, type and location of charge points available, it is clear that charging infrastructure currently presents a significant barrier to full scale BEV adoption among high-kilometre commercial drivers. But European leaders have big ambitions to tackle this issue and, across all cities, there are exciting efforts to expand charging infrastructure of all kinds. Amsterdam is one particularly interesting example, with a special emphasis on on-street charging (see **Chapter 6: Charging Infrastructure in Amsterdam**).

Uber will continue to work together with charging companies, grid operators, landowners and public bodies in whatever ways we can to help ensure that there are sufficient chargers for all drivers that need them.

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52. Map: Charger data from Open Charge Map Contributors licensed under a Creative Commons Attribution-ShareAlike 4.0 International | © Mapbox © OpenStreetMap. Shaded hexagons represent the inferred number of potential normal chargers needed for PHV drivers active on Uber if all were to be in a BEV today. Total 2025 charger demand is based on the forecasted 'high sale, high residential' scenario on p122 of the The Mayor's Electric Vehicle Infrastructure Taskforce (2019), London electric vehicle infrastructure delivery plan

53. London Datastore, Licensed Vehicles - Type, Borough

Barrier 2: The lack of affordable / second-hand BEVs

Drivers considering switching to BEVs also need to consider the upfront costs associated with purchasing the vehicle: not only the sticker price, but also the cost of financing it. Any available subsidies will also be considered in this context. In this area, there is a significant cost gap between an ICE and a BEV.

A new ICE or hybrid used by a ride-hail driver could typically cost in the region of €28,000, while suitable BEV models available today may cost in excess of €40,000 (prior to any subsidies). This is particularly true for those newer, adequately sized, longer range BEVs with a stated range of ~400 kilometres or more. These are the cars that drivers need to reliably work a full day on a single charge, based on real world performance and charge behaviour, and in all types of weather. Cheaper BEVs are available, but they normally have smaller batteries. At least one top up may be required each day, on top of the main charge. The impact of lost revenue and the inconvenience of a second charge can make these models unappealing and potentially uneconomic for drivers. BEV models with ~400km range are only just starting to become commonly available to purchase first hand today. Where they are available, drivers do indicate a significant preference for these models.

Even this superficial comparison of new car prices underestimates the cost barrier that BEVs need to overcome. In fact most ride-hail drivers drive second-hand ICEs, which can be purchased for as little as €10,000. Good second-hand options are not yet available to the prospective buyer of a BEV. As long range vehicles are only being sold in the primary market in significant volumes this year, it will likely take between two and five more years for a large and liquid secondary market of suitable, affordable BEVs to develop. This is the first point at which many ride-hail drivers will start to see them as a viable option. This means that, as of today, drivers are faced with a choice between the very high price of a new BEV and a far cheaper second-hand price of an already cheaper ICE model – a daunting price difference to overcome.

The experience of BEV drivers on the Uber app

Our engagement with drivers on the Uber app has consistently shown that the key barriers to BEV adoption are common to all. In surveying over 1,000 drivers on the platform in France and asking what would be needed to convince them to switch to a BEV, the most frequent responses were to have a longer battery life (69% of respondents), less expensive vehicles (62%), access to chargers on highways and at airports (54%) and access to a large public charging network (41%). Only 9% considered that they would never be convinced to switch to a BEV.

Drivers recognise the potential benefits of switching to a BEV and, though small in number, some have managed to switch where their circumstances make this a viable option. Among BEV drivers using the platform in France, the single greatest factor influencing their decision to switch was to reduce their expenditure per kilometre travelled. 62% of those surveyed listed this as decisive, and 33% considered it to be 'very important 'or 'quite important'. As such, once the downsides of the higher upfront cost and charging time in a BEV can be overcome, drivers can benefit from much lower variable costs, while also reducing their environmental impact.

Uber's network of BEV ambassadors in London helps other drivers with information and inspiration about moving to a BEV, and provides Uber with insights from the road to help make the BEV driving experience better, for example by giving their views on proposals for where charging could be best located. Their personal stories demonstrate that for those whose circumstances make BEV adoption feasible, reducing cost is an important motivator. Unsurprisingly, these early adopters of BEVs tend to be more likely to be those drivers who are both able to install a home charger and to more easily afford their vehicle, or at least a sizeable deposit. Like many early adopters this means they are not

perfectly representative of ride-hail drivers as a whole. But nevertheless their stories show how if upfront cost and charging pressures could be eased, then we would likely see the same motivation to reduce operating costs play out, ultimately leading to a steady rise in BEV adoption among the broader population of commercial drivers.

The BEV ambassadors and their reasons for switching

Kamel, Nissan Leaf - I was considering switching to a cleaner, more economical car well before the introduction of the congestion charge zone (CCZ) and ultra low emission zone (ULEZ), but the introduction of the charges made me move faster. I was satisfied with the range advertised but I had a big worry about the whole charging process (where, how long, the cost etc).

Charlie, Nissan Leaf - Like many the introduction of the CCZ set me thinking seriously about EV. Initially I was thinking plug-in hybrid. But after some further research it became obvious that full BEV was the way to go. I was also getting harried by my kids into going green as well.

Ventsislav, Kia E-Niro - The main reason to switch to BEV is to make my business more efficient by cutting cost and increasing service quality at the same time. The anxieties are mainly linked to charging infrastructure which is not well maintained and predominantly busy with black cabs and other commercial cars.

Todor, Nissan Leaf - My main reason to switch to a BEV was to avoid paying the CCZ and ULEZ, since my old car didn't meet emissions standards. That was a huge amount to be paid annually. The price was something that was holding me back initially.
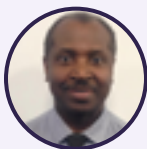
Vince, Tesla Model 3 - Environmental reasons, running cost and the love of new technology. I used to hate the smell of the car exhaust when I put or took my car out of the garage.

Olu
Tesla Model 3
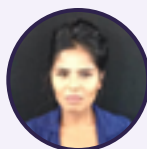
Razma
Tesla Model 3
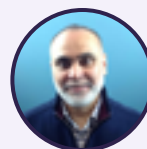
Imtiaz
Nissan LEAF

Barrier 3: Insufficient financial incentives to close the interim cost gap

For those commercial drivers able to overcome the initial hurdle of a BEV's upfront cost, the subsequent day-to-day running costs are typically cheaper; overnight charging has a much lower per kilometre price than petrol or diesel; and the fewer moving parts in a BEV generally lead to lower maintenance costs. However, these savings do not close the TCO gap created by that high initial sticker price. This is before the potential opportunity costs of intraday charging are factored in for any driver without access to a near-home, overnight charger.

Keeping TCO as low as possible is important for high-kilometre commercial drivers to maximise their take home earnings and to make a good living from driving. If the TCO of a BEV is higher than their best alternative - a used ICE hybrid for example - then it is understandable that a driver would choose the vehicle with the lower TCO. Since this group drives a lot, however, all of society benefits when they are among the first drivers to electrify.

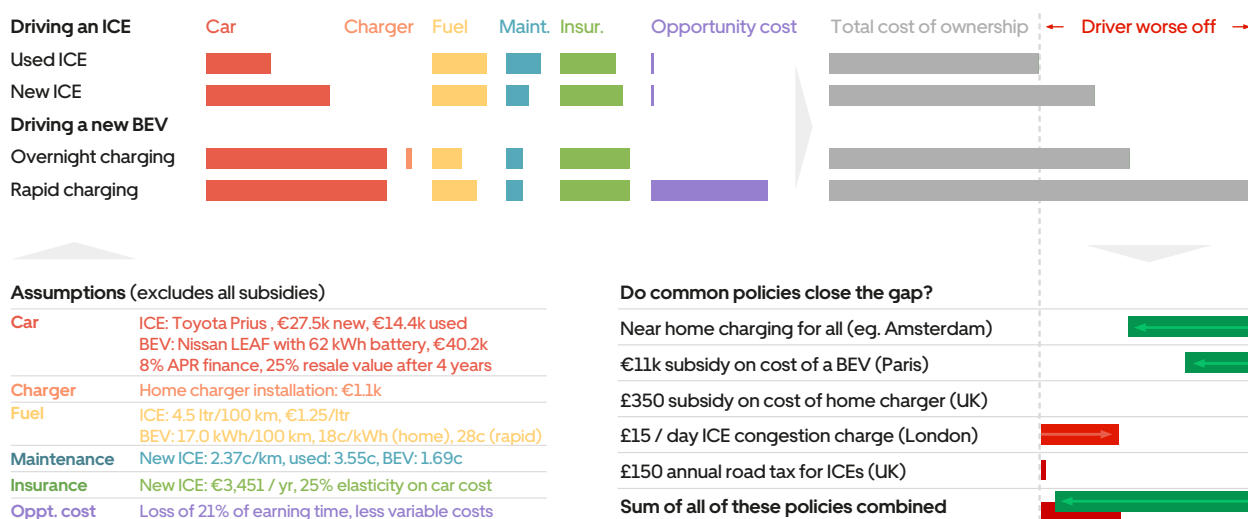Accordingly, in addition to tackling insufficient charging infrastructure and the absence of affordable BEVs, there is a need for financial incentives to close the remaining TCO gap.

Ride-hail drivers' total cost of ownership is often worse in a BEV. Uber is doing what it can to reduce BEV TCO, but more must be done to further tilt the playing field

Assumptions (excludes all subsidies)

Car	ICE: Toyota Prius , €27.5k new, €14.4k used BEV: Nissan LEAF with 62 kWh battery, €40.2k 8% APR finance, 25% resale value after 4 years
Charger	Home charger installation: €1.1k
Fuel	ICE: 4.5 ltr/100 km, €1.25/ltr BEV: 17.0 kWh/100 km, 18c/kWh (home), 28c (rapid)
Maintenance	New ICE: 2.37c/km, used: 3.55c, BEV: 1.69c
Insurance	New ICE: €3,451 / yr, 25% elasticity on car cost
Oppt. cost	Loss of 21% of earning time, less variable costs

Do common policies close the gap?

- Near home charging for all (eg. Amsterdam)
- €11k subsidy on cost of a BEV (Paris)
- £350 subsidy on cost of home charger (UK)
- £15 / day ICE congestion charge (London)
- £150 annual road tax for ICEs (UK)
- **Sum of all of these policies combined**

This chart quantifies the different components of the TCO for ride-hail drivers using new and used ICEs, and a new BEV with or without overnight charging. The analysis will be different for different drivers based on how they choose to work, but here we consider the situation facing drivers who choose to drive for ~35 hours a week and have sole use of their vehicle (fewer hours and sharing of vehicles between drivers generally makes the TCO of BEVs less favourable). Upfront costs of the vehicle and a home charger (as well as finance) are spread over a four year ownership period before the vehicle is re-sold. In this case we assume that overnight charging takes place at home with a private charger, but the economics of public overnight charging are similar. We also assume that there are no subsidies in place of any kind, so as to isolate the extent of the TCO gap prior to any deliberate actions taken to close it.

In the absence of mitigating measures, the combination of a lack of a second-hand market and the opportunity cost of charging can make the TCO of a BEV inferior to an ICE by a large margin. The gap is considerably smaller for those who can charge overnight than it is for those who can't, and depends on a driver' personal circumstances

and ICE alternatives - but nonetheless drivers using BEVs may well find that their total costs are higher than those operating a second-hand ICE. Other studies and reports have used similar input assumptions and TCO methodology, but - understandably - simplified the analysis by comparing a new BEV versus a new (not used) ICE; or not included the full potential opportunity cost for a driver without a home charger. As a result their conclusions may not always capture the full extent of the economic impacts of a BEV for many drivers.

Without further efforts to remove barriers or to tilt the playing field, these meaningful TCO differences can reduce net earnings for drivers, which would significantly inhibit the acceleration of BEV adoption across Europe. Crucially, this extends far beyond ride-hail drivers. The higher costs and inconvenience of shifting to a BEV will prevent large swathes of high-kilometre commercial drivers - many of whom face a very similar TCO calculus - from making this necessary change. However, with the right policies, governments can help close the gap; and indeed, it can be completely eliminated if ambitious policies are combined effectively.

European governments and city authorities have taken steps to address these issues, and their policy measures have narrowed, but not closed, the TCO gap. Certain cities have introduced particularly impactful policies which can have a big impact on the relative TCO (and relative earnings) of BEV vs ICE driving. These include the rollout of blanket near home charging in Amsterdam which can substantially eliminate opportunity cost; the introduction of the congestion charge for ICE ride-hail drivers in London, but with an exemption for BEV drivers worth up to ~£4,000 for per year; and generous subsidies for BEV purchase for those living in Paris.

Indeed government subsidies for BEV purchase play an important dual role, directly cutting the overall TCO as well as helping to overcome the immediate barrier presented by the high sticker price. But even with the significant subsidies on offer - see the chart below - a surprisingly large TCO gap can still remain. Even the most generous BEV subsidies on offer today are nowhere near enough to cover either the ~€30,000 price difference between a long range BEV and a second-hand ICE, or the potential opportunity cost of charging - let alone both.

In designing BEV support schemes to close TCO gaps, there are good reasons to focus attention on high-kilometre commercial drivers both because of the specific challenges around opportunity cost, but also because it can be a more efficient use of public money.

Today's schemes do not appear to be overtly focussed on the important idea of incentivising BEV kilometres rather than BEV ownership, which is what matters for reducing emissions. In particular ride-hail drivers - unlike taxi drivers - often receive a lower level of subsidy than consumer drivers despite driving much greater distances, and so creating a much greater CO_2 benefit when making the switch.[54] Though no subsidy scheme is perfect, spending more money on consumer BEVs for potentially less benefit risks making subsidy spend less cost effective for taxpayers in terms of maximising CO_2 savings per Euro spent.

City	Consumer	Taxi	Ride-hail
Amsterdam	€4.0k	€3.0k	€3.0k
Berlin	€9.0k	€9.0k	€9.0k
Brussels	€0.0k	€0.0k	€0.0k
Lisbon	€3.0k	€5.0k	€2.0k
London	£3.0k	£7.5k	£3.0k
Madrid	€4.0k	€4.0k	
Paris	€13.0k	€11.0k	€11.0k
Average	€5.2k	€5.8k	€4.6k

+ 11%   − 11%

Total BEV subsidy available by city and driver type

54. BEV subsidy schemes: Amsterdam (Taxis, Other), Berlin, Lisbon (Taxis, Other), London, Madrid, Paris (National, Paris, Ile de France)

In many countries the second-hand vehicles that ride-hail drivers favour are not eligible for subsidies. Though second-hand purchases may benefit from some level of 'trickle down' from subsidies when a vehicle is first sold (and could be at greater risk of certain kinds of subsidy abuse), this is still a missed opportunity. The second-hand market is important, because in environmental terms, many ride-hail drivers can effectively 'upgrade' second-hand BEVs from consumers into much higher use. These BEVs get a new lease of life, displacing far more CO_2 from the ride-hail ICEs they replace than they ever did when they were in consumer hands. Any measures governments can take to establish a vibrant second-hand market that ride-hail drivers can tap into will therefore have a big benefit in further reducing emissions.

In summary

When the impact of these barriers is assessed collectively, a ride-hail driver who drives a used hybrid and who switches to a BEV may, today, face a reduction in their earnings. This can be partially mitigated by ensuring that they have reliable access to a charger at or near their home, and can buy a second-hand longer range BEV - or more likely for a few years at least, they receive a generous subsidy on a brand new BEV.

For many drivers in many cities, purchasing a BEV is not yet an economically optimal choice. While the barriers we have described remain in place, this will continue to be the case for a large proportion of ride-hail drivers and high-kilometre commercial drivers more broadly, until infrastructure improves and a robust second-hand market for long range BEVs develops.

Without mitigating measures BEVs are still a challenging option for ride-hail drivers

A driver in a **second hand BEV** charged overnight will eventually earn more Ⓑ than they would in a used ICE, even without any mitigating taxes or subsidies

However drivers in a **new BEV** today may face an earnings gap Ⓒ even using overnight charging. With rapid charging the gap can be larger Ⓓ if the driver cannot manage down the impact of opportunity cost

To try and close this earnings gap:

Drivers can look to charge overnight or to combine charging with breaks to move from Ⓓ → Ⓒ

Uber can work with carmakers & financiers to make BEVs more affordable, and to generate new business for BEV drivers. This moves Ⓒ & Ⓓ up

Governments can tax ICEs which moves Ⓐ down, and can subsidise BEVs which moves Ⓒ & Ⓓ up

2020-30 net earnings scenarios for ride-hail drivers in different vehicles, in an EU ride-hail market with no mitigating measures, as the cost of BEVs falls

Used ICE
Ⓐ
Ⓑ
2nd hand BEV
2nd hand market emerges
New ICE
New BEV
Ⓒ
Overnight charging with no opportunity cost
2nd hand BEV
2nd hand market emerges
New BEV
Ⓓ
Public rapid charging with 100% opportunity cost

2020   2025   2030
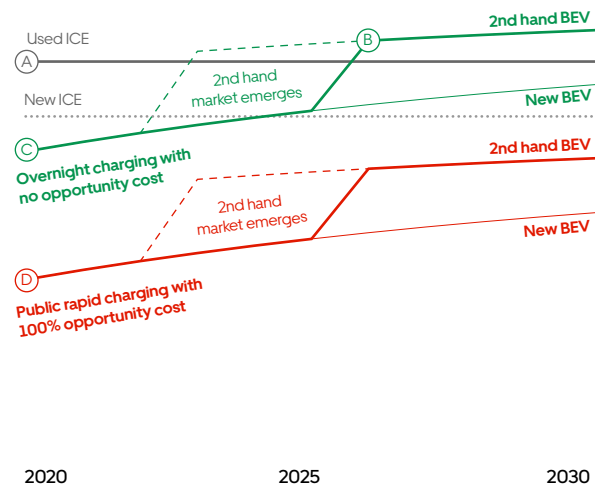
Case study: Making the jump from diesels to BEVs in Paris

Policymakers across France are making a concerted effort to facilitate greener transport, with environmental issues rapidly rising up the agenda. After banning sales of diesel and petrol cars by 2040, the French government is looking to accelerate BEV adoption. At a city level, the Mayor of Paris aims to ban diesel cars by 2024 and all ICEs by 2030.

Yet there is a long way to travel in a short time – France has one of the highest number of diesel vehicles in the EU, which is reflected among PHV drivers. If the right conditions are not in place well before an ICE ban takes effect, such policies risk creating economic turmoil for commercial drivers. In the case of Paris, there is also a risk that the diesel ban may simply move drivers into petrol or hybrid vehicles, rather than encouraging BEV adoption. There are a number of steps that Uber is taking to facilitate the jump straight from diesel vehicles to BEVs in Paris; and some policy measures that we believe could further support this transition.

Alongside the publication of this report, we announced that diesel vehicles will be gradually phased out from Uber's platform in France by 2024. From January 2021 Uber will no longer onboard newly purchased diesel vehicles. Then from 2022 we will no longer onboard any diesel vehicle regardless of its age. As a result of these two measures we expect diesels on our platform to decline steadily. In addition, and just as importantly, we have developed a package of support to encourage drivers to switch to BEVs.

Tackling the finance gap

Uber is launching a 'Plan for Electric Mobility' to support drivers with the cost of transition. We expect €75m to be raised by 2025. This scheme could help drivers reduce the upfront cost of a BEV by up to ~€4,500 and contribute to lowering the TCO gap between a BEV and an ICE.[55]

Building partnerships on charging

Uber is partnering with EDF and Power Dot to provide discounts for charging as well as new charging hubs in Greater Paris with exclusive access for drivers on the Uber platform.

Helping drivers to make the switch

Uber will help drivers better understand BEV & ICE costs, allowing them to make decisions that make economic sense for them. Uber will also work closely with a group of BEV drivers – our French BEV Ambassadors – to help educate all other drivers on the pros and cons of transitioning to a BEV.

In addition to the steps that Uber is taking in France, it is crucial that policymakers take measures, together with the rest of the industry, to mitigate the risk of increased petrol or hybrid use (instead of BEVs) as a result of the diesel ban. Central amongst these is increasing the number of charge points in Greater Paris. Our surveys suggest that around half of drivers cannot install a home charger and so would rely on public charging infrastructure. Without near-home public charging, switching will not be economically viable for many. Installing near-home public charge points, especially in Greater Paris (Paris, Essonne, Hauts-de-Seine, Seine-et-Marne, Seine-Saint-Denis and Val d'Oise), would have a significant impact. This could be bolstered by a larger network of rapid charging stations, and increased financial support for those drivers that are able to install home chargers.

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55. Estimate for a driver in France who chooses to use the Uber app for 42 hours a week

Beyond addressing the charging challenge, there is considerable value in offering more financial support to PHV drivers looking to switch. At a national level, private car owners benefit from a higher purchase subsidy (€7,000) than professional drivers (€5,000), yet high-kilometre commercial drivers can drive a far greater environmental benefit by switching - there is a strong case for equalising subsidy levels, at a minimum. There is also scope for action at a regional level, as in the Ile-de-France region which grants professionals (including PHV drivers) an additional €6,000 to switch. Access to finance is another major barrier that could be tackled through zero-interest loans, which Uber has found to be popular amongst drivers on the platform.

Finally, there are non-financial policy measures that can encourage greater BEV use. Access to city centres and areas of high demand is critical; where cities are considering pedestrianising these areas and / or restricting vehicle access, we would encourage policymakers to allow equal access to clean shared vehicles. This would add an important incentive that directly ties BEV adoption to potential earnings growth. Another would be to permit BEVs to park near busy areas such as train stations. These 'soft incentives' should apply to types of vehicles rather than types of driver - high-kilometre drivers have a comparable environmental impact regardless of whether they are a taxi driver, a PHV driver or another type of commercial driver and all should be encouraged, equally, into a BEV.

Collective efforts from Uber, drivers, passengers, carmakers, charging providers and the Paris municipality can remove the barriers to electrification. This work will be crucial to phase out diesel in a fair manner and to push towards electric - not petrol - mobility over the next five years.

Chapter 5
New uses for public data

High quality data is essential for good policy making and policy implementation. The data and processes used to set, measure and enforce fuel efficiency and emissions standards for ICE vehicles have been a prominent topic in recent years.

The growing BEV sector faces a different challenge: to serve up data that already exists within public bodies so that it can be used to guide day-to-day actions to minimise emissions. Ultimately, each journey a driver makes, each decision on where to locate a new charger, and each tweak of tolls and taxes on driving needs to be shaped by a better understanding of what its impact will be on emissions.

Companies like Uber can help by providing aggregated data on where charging for ride-hail drivers may be required, or by reporting CO_2 emissions per kilometre from trips on the platform as we have pledged to do.

However there is far more valuable data that is already sitting in the public realm, waiting to be put to new uses.

Public data can guide better electrification decisions

The nascent BEV sector is embedded in a broader market - passenger vehicles - which is large, mature and where governments have been collecting data of all kinds for many decades: on car models, registered addresses, engine types and so on. Useful data is already collected in many cases; government agencies already have access to a wide range of data on the BEV / emissions landscape. This includes, for instance:

- EV registrations in any given street, city or region

- Data on vehicles travelling in certain areas

- Emissions profiles of individual vehicle models

- Availability of land and grid capacity

Using this information means housing it in a suitable format and providing it to the right public and private sector actors who can use it on a day-to-day basis. They might include:

- **Local planners & policymakers** looking to measure and progressively improve air quality, BEV uptake and expand infrastructure for their residents

- **Chargepoint operators** & **local distribution network operators** making decisions on where and how much to invest in new charging stations

- **Transport agencies** looking at ways to tax, toll or restrict road use in cities to encourage smoother traffic flow and reduce emissions on specific streets

- **Individual consumers** wanting to do the right thing by the environment

These market participants can then act together in new ways to more quickly tip the balance in favour of EVs.

The key challenge is to use existing data sources (ensuring compliance with all relevant data protection legislation) to improve the ability of the market to deliver against governments' emissions reduction objectives.

The current inability for market participants to easily access and digest important data creates a range of barriers to change, including:

- A lack of public awareness and attention towards the quality of the air they breathe

- Insufficient information for charging companies planning investment, leading to new infrastructure being built in areas of low demand, or not built at all

- An inability to create incentives and price signals aimed at specific vehicle models
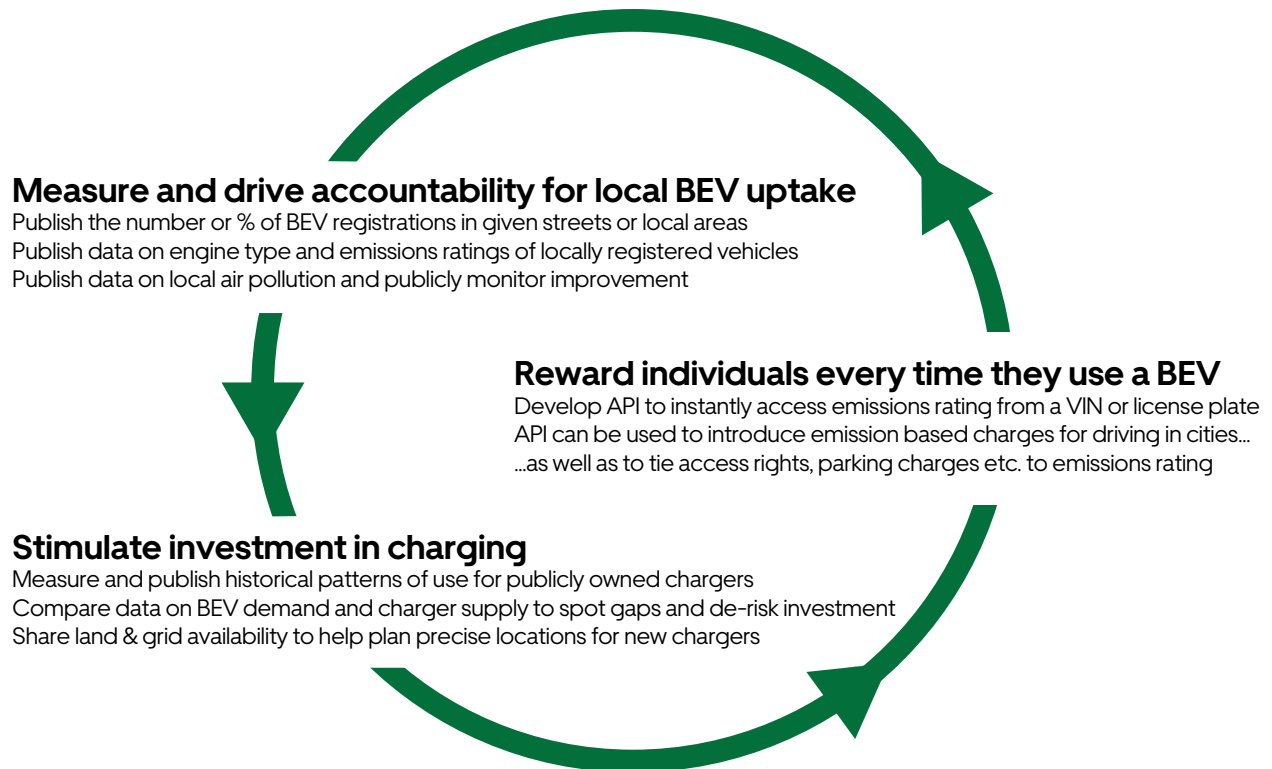
This is a problem that we feel can be addressed, and must be if EU ambitions on the BEV agenda are to be fulfilled. Ensuring that public data is available for novel use in promoting BEV uptake should be the default option for all governments. This way market participants can make informed, effective decisions, and broader society can keep up the pressure for change.

Public data can drive the flywheel of BEV use

Imagine a world where:

- Chargepoint operators install new chargers exactly where they are needed

- Emissions charging zones can be rolled out anywhere quickly and cheaply

- Drivers are financially motivated to make a greener choice by 'smart' charges for the trips they take and the emissions they create

- Consumers always know how good a vehicle or journey will be for the environment when they choose it

- Citizens can scrutinise city authorities' performance on emissions and BEV uptake

All of these are possible with a better flow of existing public data into new uses. While there are varying degrees of difficulty in making the required data available to those public agencies and private companies who could best make use of it, it is vital that every effort is made to do so. Together such data can create a virtuous cycle that accelerates the electric transition, increasing electric kilometres driven and reducing emissions:

Measure and drive accountability for local BEV uptake
Publish the number or % of BEV registrations in given streets or local areas
Publish data on engine type and emissions ratings of locally registered vehicles
Publish data on local air pollution and publicly monitor improvement

Reward individuals every time they use a BEV
Develop API to instantly access emissions rating from a VIN or license plate
API can be used to introduce emission based charges for driving in cities…
…as well as to tie access rights, parking charges etc. to emissions rating

Stimulate investment in charging
Measure and publish historical patterns of use for publicly owned chargers
Compare data on BEV demand and charger supply to spot gaps and de-risk investment
Share land & grid availability to help plan precise locations for new chargers

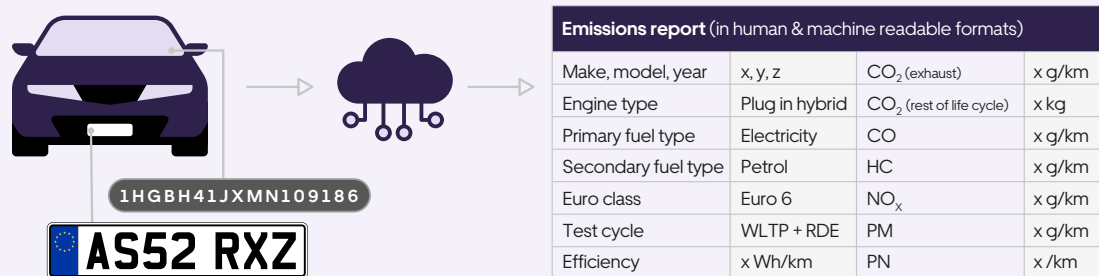**Open public data can drive the flywheel of BEV use**

Some city authorities have grasped the problem and taken the lead in using data to further their policy aims. For example, Transport for London (TfL) operates charging zones that rely on a comprehensive database of UK drivers and their vehicles to enforce a form of emissions-based road pricing that encourages the use of less polluting vehicles.

In Amsterdam the government, in partnership with its contracted charging operators, makes impressive, extensive and well documented use of data in planning and managing the charging network.[56] Detailed data allows for an understanding of where BEV driver demand is growing, where new chargers should go and what business approaches are working. New chargers can be located with confidence in areas with the demand to support them, and operated in a way that maximises their effectiveness.

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56. Creating Tomorrow (2019), E-mobility: getting smart with data

Electronic emissions ratings can unlock new ways to incentivise BEV use

1HGBH41JXMN109186

AS52 RXZ

Emissions report (in human & machine readable formats)			
Make, model, year	x, y, z	CO_2 (exhaust)	x g/km
Engine type	Plug in hybrid	CO_2 (rest of life cycle)	x kg
Primary fuel type	Electricity	CO	x g/km
Secondary fuel type	Petrol	HC	x g/km
Euro class	Euro 6	NO_x	x g/km
Test cycle	WLTP + RDE	PM	x g/km
Efficiency	x Wh/km	PN	x /km

Considering its importance to society, it can be surprisingly difficult to determine how emitting a vehicle is. Beyond the well-documented challenges of rating a car's 'real-world' emissions, once an emissions rating has been established it is often not easily accessible for use.

By developing a real time electronic API to provide access to individual real-world vehicle emissions ratings, governments can enable lots of new ways to incentivise BEV adoption. This should include both emissions of CO_2 and other pollutants. Better access to this data can allow consumers, city authorities and private companies to differentiate and discriminate in favour of more environmentally friendly transport options.

Consumers	Can **access the latest data** on rated & real world emissions when evaluating a car purchase
Transport agencies	Can automate processes to: • **Measure** average or total emissions of cars using a certain street • **Charge vehicles** to use a certain area of the city based on their emissions • **Check eligibility of vehicles** using a zone, street or lane reserved for low emission vehicles
Parking operators	Can **charge different amounts for parking** depending on emissions
Ride-hail, taxi or other mobility companies	Can **present emissions estimates to passengers** from different trip types so they can make informed choices
	Can allow riders to **choose a lower emitting vehicle**
	Can **accurately measure emissions** from their platform for reporting and to design offsetting options

Chapter 6
Policymaking principles and recommendations

Drivers of all kinds operate in a market and are highly sensitive to economic signals. In a competitive market, consumer pressure will naturally push them towards the lowest cost option once all factors, including convenience, are taken into account. As we have seen from previous chapters, for most ride-hail drivers a BEV is often not that option, without explicit government intervention. That is why governments and city leaders have a key role to play in shifting incentives towards accelerated BEV adoption.

Policymakers across Europe are already starting to do this with some degree of success. Ideally, proven policies from one city could be simply adopted by another to increase BEV adoption. In practice, policies need to be adapted as local context differs, from the state of the public transport system and levels of car ownership to the nature of the local government and its fiscal powers. However, in studying the features of various cities in Europe where Uber is active, it is possible to glean various key underlying principles that we believe ought to guide policymaking as it drives towards the goal of replacing ICEs with BEVs. These can then be tailored to local circumstances.

Key principles for policy development

In keeping a steady eye on environmental goals across Europe, we consider that there are 5 key principles for action:

1. Think in terms of BEV kilometres rather than BEV ownership, with equal treatment for any type of driver who drives the same distance

As discussed throughout this report, there is a particularly pressing need to accelerate the adoption of BEVs among high-kilometre commercial drivers. For these individuals, the environmental benefits of shifting to a BEV will be the greatest, but without the right commercial and policy frameworks in place, the costs may impede the transition.

Replacing ICEs that are heavily driven with BEVs saves far more exhaust emissions than replacing those that are mostly parked. Replacing a ride-hail driver's vehicle with a BEV can generate four times the benefit, or more. Incentivising those who drive furthest to switch to a BEV is the best use of public money. This could be done either by focussing support on high-kilometre drivers directly (in a fair way that applies to anyone), or by building incentives that target the ongoing 'variable' costs of driving, and so scale naturally the more a vehicle is used. Similarly, incentivising vehicle manufacturers to make the right kind of vehicles for high-kilometre drivers can improve the effectiveness of subsidies.

It is important that this should not incentivise individuals to drive further; rather, it is about ensuring that those that already drive long distances, whether for work or otherwise, are able to switch and limit their environmental impact. Equally, there are no environmental grounds to discriminate between different types of drivers, whether they are private or commercial (be that a taxi, ride-hail, delivery or any other type). All drivers who drive the same

distance, in the same place, in the same car will harm or help the environment to roughly the same extent. Wherever practical, environmental measures should be applied to all drivers equally, in proportion to the distance they drive.

2. Prioritise change in cities

All kilometres driven in an ICE have a negative environmental impact that extends far beyond the areas in which those kilometres were driven. The effect of CO_2 emissions is global. However, heavy ICE use and congestion in cities has an additional direct impact on human health through the emission of NO_x, particulate matter and other harmful pollutants. With extensive public transport options often available and shorter distances travelled on each journey, travel within the city is where there is the greatest opportunity to reduce (or even eliminate) ICE use. While some trips will likely always need a car, in urban areas it is particularly important that those trips take place in efficient, shared, high use electric vehicles.

Prioritising cities will also ensure that the most densely populated areas lead the way in the transition to BEVs, helping to address a range of associated urban public health issues. In addition, the scale benefits of having as many drivers as possible accessing the same charging point – crucial to building the business case for charge point viability – is usually much more prevalent in an urban setting. Prioritising change in cities can therefore drive private investment into urban charging infrastructure.

3. Apply fiscal incentives to tilt the playing field from ICEs to BEVs

While the TCO gap remains, drivers have a strong incentive to choose the cheapest option. Governments must deploy the right fiscal incentives to tilt the playing field, eliminating the gap between ICEs and BEVs and smoothly and equitably accelerating a popular change.

Economic incentives can be introduced at small scale and increased over time. Those who can switch most easily will move first, and those who cannot for whatever reason - reasons that can never be fully anticipated when policies are designed - will move eventually, after taking a little more time to prepare.

Historically, the most frequently used tool to tilt the playing field away from ICEs is fuel tax. Fuel has been taxed for decades, partly in recognition of the negative impact of emissions on our environment. Many other taxes for road use can also be tilted in such a way as only to apply to emitting vehicles, and many countries do this already. The London Congestion Charge Zone is one prominent example - it doesn't apply to BEVs. The resources raised through these taxes can go towards BEV subsidies or infrastructure development, further levelling the field for drivers choosing a new vehicle by helping to eliminate the TCO gap.

4. Focus on policies that make BEVs the best economic choice. Bans are most suitable towards the end of the transition to cement, rather than initiate the change

The best policy transitions are those that go with the grain of existing patterns of human behaviour, amplifying and accelerating existing trends. An ICE ban on its own cannot build the BEV ecosystem needed to create a long-term solution for a city.

Price is a powerful lever and market-based solutions can change behaviours fast. But they can also drive a less disruptive and more equitable transition for every type of driver. By ramping up smoothly over several years, price signals from government can accelerate the transition while incentivising the right incremental investments, at the right times, to reduce emissions with the least possible hardship.

Bans should come in once market and policy conditions are such that BEVs are already the more affordable choice; implementing them too soon, especially when they don't apply equally to everyone, creates cliff edges which push the costs of environmental improvement onto a minority of drivers with often unforeseen and unfair consequences that don't always lead straight towards fewer emissions. Prematurely banning ICEs in ride-hail,

for instance, could cause significant hardship to individual drivers who have invested in an ineligible vehicle; but it could also lead to higher prices for consumers that push them back into private ICE cars. By providing a seemingly easy fix, bans can also delay the focus on hard challenges like charging infrastructure. When applied too early they are unlikely to be the best way to create a smooth transition and will often create negative sentiment among the people being asked to make the change.

Instead, it will be more effective to first introduce a broad set of fiscal policies that give all drivers economic reasons to switch to a BEV, combined with a concerted build out of charging infrastructure. Once the economic conditions are right, a ban can then cement a change that is already well on the way to completion. Announcing a ban many years ahead can act as a signalling message to drivers, but it is important to keep tilting the playing field to make BEVs the better choice well before the ban kicks in. Bans can take different forms. A ban on new ICE sales, for instance, can be reasonably implemented as soon as fiscal policies have made a BEV the better choice anyway. However, where a ban also applies to existing vehicles (such as a city-wide zero emission zone), a longer delay in implementation may be required in order to give a reasonable period (five years, say) for old ICEs to cycle out of the fleet. Otherwise those who made a reasonable choice to buy an ICE some years ago will still be adversely and unfairly affected.

The best bans formalise the change that has already happened - as such they are hardly noticed.

5.   Take a comprehensive view of the policy set needed to shift from ICEs to BEVs, including vehicle production, charging & incentives

The shift to BEVs from ICEs presents the driver with a number of variables and unknowns: the added cost, the uncertainty of charging, the variable tax regime and different running costs, among many others. Carmakers will play an important role here in addressing some of these concerns. Marketing low emission vehicles to an often sceptical and conservative public is the kind of thing the private sector does well.

However, there are many steps that need to be taken which will each have significant public benefit and which can only be done by governments. Governments must take comprehensive action across the full variety of levers that they alone control, whether that be releasing land for charging, implementing subsidies and taxes, or setting new targets and incentives for carmakers to reduce emissions of new models. Addressing just one of these will seldom prove sufficient on its own. For example, addressing upfront car costs might be effective for some consumer BEV buyers, but is unlikely to prove decisive for ride-hail drivers for whom operating costs and the opportunity cost associated with charging may still dominate, and who are often less likely to install a private home charger. A hard push on infrastructure, without a simultaneous push on the cost of the BEV, might undermine the economics of installing infrastructure and slow down the evolution of the whole system. These measures are all links in a chain - it is not enough to choose just one of the blocking factors and push extra hard there; governments and city leaders need to consider how all the links fit together.

Case study: Charging infrastructure in Amsterdam

Beginning with 100 charge points in 2009, Amsterdam is now well ahead of other cities in terms of charging infrastructure. Its interventions are an important example of how a comprehensive strategy for charging can move the dial. More importantly, it shows that a large network of on-street charging infrastructure can operate break-even without subsidies, and without charging excessive prices to drivers.

The right to charge

Amsterdam has focussed on a uniquely consumer- and demand-led approach to charging provision. With up to 90% of residents and workers in Amsterdam relying upon on-street parking, the need for public provision was clear. Amsterdam's de facto 'right to charge' initiative was designed to give a right to request a charger installation to those either with a BEV or intending to purchase one, and with no existing chargers within 300 metres of their residence. A charger would then be operational within 4-6 months. The policy has been a success: not only did it address potential concerns about the availability of chargers, the policy also resulted in high utilisation as chargers were placed where demand was assured. This proved much more effective than 'strategically' placed chargers at key locations (such as shopping areas and government buildings), which were underutilised.

The importance of utilisation and data

Utilisation matters. As many of the costs of operating a charger are incurred upfront upon installation, charge point operators must be confident that it will be used sufficiently to ensure that they can (at least) cover their costs.

Amsterdam's demand-driven model has been key to keeping utilisation high, as chargers are installed at the request of consumers. However data is also vital to enhance the investment case for additional chargers. In Amsterdam and across the Netherlands, detailed analytics on charging and BEV policymaking is at the centre of everything they do.[57] Utilisation data is available at the level of each neighbourhood and individual charger. By tracking this data across the city, it becomes easier to determine that an additional charger in any given location will be used enough to justify the cost of installation. Going forward, the clustering of chargers will also strengthen the investment case for charging infrastructure further, as the capital expenditure and operational expenditure of securing a grid connection can be shared by multiple chargers. This has the additional benefit of giving BEV drivers more certainty, as they can be confident that a charger will be available where and when they need one.

Emphasising near-home overnight charging

The Netherlands has a ratio of normal (≤22kW) to rapid (>22kW) chargers that is many times higher than other European countries. There has been a distinct and concerted push in this area that other countries have not yet followed. This is partly a reflection of the unique geography of the Netherlands, where the relatively short distances travelled reduce the need for extensive rapid charging infrastructure. However, it is also a result of a policy choice and adapting to local needs – most drivers in the city need to park on the street and enabling them to charge at the same time has proved to be a cheap and effective option.

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57. Creating Tomorrow (2019), E-mobility: getting smart with data

A focus on this type of infrastructure makes overnight charging the norm, not only removing the opportunity cost associated with rapid charging during the day, but significantly reducing the stress imposed on the grid. It is also more affordable; while rapid charging in Amsterdam costs roughly €0.65 per kWh, normal on-street public charging can be used for €0.34 – only €0.12 more than home charging and without the upfront cost of installation.

There is a legitimate concern in some cities around how the growing installation of on-street charging infrastructure would affect public space, leading to some calls for greater use of a hub charging model. But it is important to recognise that near-home charging has huge benefits for ride-hail and other commercial drivers in reducing the opportunity cost of charging, which rapid charging at hubs cannot offer. The ability to charge overnight can make or break the economics of a BEV for many ride-hail drivers. The model that Amsterdam has used to date has gone a long way to improve the economics of BEV adoption in ride-hail, and is one that we would encourage other cities to consider.

Lessons for policymakers on charging infrastructure

Amsterdam's example provides clear lessons for policymakers elsewhere:

- Centralising the provision of charging infrastructure at the city level enables a coherent strategy and accelerates learning. This is a citywide 'network' problem that is best solved at a citywide level

- Providing charging at the request of a driver (or group of drivers) guarantees the demand needed to make the case for investment and ensures that chargers are in the right places

- Harnessing utilisation data can enable city authorities to better plan the location of new charging infrastructure, and help develop the investment case for it

- Researching and providing the exact type of charging infrastructure needed in any given area allows for more efficient investment and better use of public space

- Ensuring 'interoperability' so that virtually any car can charge at any location, all payment cards work anywhere, and infrastructure can be easily transitioned to the next operator at the end of the tender makes charging convenient for everyone

- Widespread near-home, overnight charging can be offered on an economically sustainable basis, and plays a key role in improving BEV economics for many drivers

Policy recommendations

When guided by these principles, we believe that there are several specific policies that could address the core barriers to BEV adoption across Europe, when adapted to local contexts. A comprehensive policy approach that follows the principles we have set out, could, in our view, consist of the following:

Barrier 1: The lack of appropriate charging

1.   Ensure all high-kilometre drivers can reliably access overnight charging at or near their home, where they would normally park

Without near-home charge points, it will not be economically viable for large swathes of high-kilometre commercial drivers to shift to a BEV, given the potential opportunity cost associated with rapid charging during working hours.

Treating charge points as critical public infrastructure with centralised funding, planning and delivery (at the city level, but within a national framework) can help facilitate this. The rollout of charging will touch the essential fabric of city life, and so it cannot be solved by the market alone, or by individual parts of a city in an uncoordinated way. This is an issue requiring centralised leadership that can plan a network for entire cities, adapt operations and commercial frameworks to local needs, manage data effectively to locate new chargers profitably, and fund initiatives that are not viable for commercial entities.

Like in Amsterdam, national governments and city authorities could adopt a 'right to charge' approach,where installation is led by requests for on-street or shared building infrastructure from prospective or existing BEV owners without the ability to charge privately, ensuring low income areas are not left behind. As in Amsterdam, priority could be given to requests from high-kilometre drivers, such as taxi and private hire drivers. When the market is still nascent, this is a much more effective way of assuring high utilisation and kickstarting the investment case.

Barrier 2: The lack of affordable / second-hand EVs

2.   Stimulate the rapid development of an affordable / second-hand market for the kinds of long range BEVs starting to be sold new today

The development of a viable second-hand market will transform the value calculations made by drivers when considering switching. second-hand BEVs are available but they are generally old and short-range, made obsolete by the furious pace of change in the BEV sector. Drivers want and need a vehicle that can go a full day on a single charge, and the market is at a tipping point. The right kind of ~400 kilometre range vehicles are just starting to be sold today in increasing volumes, but they will likely take between two and five years to appear again on the second-hand market. Given the still small volumes of new BEV sales, it is unlikely that sufficient second-hand BEVs will be available to the general public at affordable prices for many years.

To a certain extent this market will naturally evolve over time, but there are things that can be done to pull the future forwards. In Amsterdam and Paris second-hand purchases are included in the subsidy programme, supporting resale as well as first sale. Meanwhile incentives and tax breaks for buyers of BEVs in the primary market, especially certain types of large fleet buyers who tend to replace vehicles quickly to keep their fleet fresh, would both encourage more BEV volumes overall as well as a rapid flow into the secondary market. This will give ride-hail and other high-kilometre drivers earlier access to a BEV that they couldn't otherwise afford, fast forwarding the societal benefits of getting as many BEVs as possible into the hands of those who drive the most.

Barrier 3: Insufficient financial incentives to close the interim cost gap

3. Offer enhanced subsidies and weightings to those BEVs sold to and used by high-kilometre drivers

A widespread shift to BEVs and total phase out of ICEs will not occur until the TCO gap narrows. One driver of the gap is the sticker price of a BEV. Current purchase subsidies are generous and provide an important source of financial assistance for drivers looking to switch. However, they typically incentivise BEV ownership independent of use. It is wasteful for so much relief to be channelled towards consumers without regard to their need, or their likely use of the vehicle.

The impact of subsidies could be improved, and their overall cost reduced, by targeting high-kilometre drivers who can save the greatest amount of emissions in a BEV. Many of these drivers are also among those least able to finance the upfront cost of a BEV without support. This could be provided either via outright subsidies, or via scrappage schemes to take polluting ICEs off the road. These subsidies should of course also apply to all types of high-kilometre drivers – be they taxis, ride-hail vehicles, delivery vehicles or private vehicles. Drivers who have the same environmental impact should broadly be treated the same.

On the supply side, there is also an opportunity to incentivise carmakers to ensure that clean cars end up in the hands of drivers where they will do the most good. For example the system of 'super credits' in the EU's mandatory emission reduction targets for carmakers could be extended to give substantial extra credit to those BEVs that are sold to high-kilometre drivers in recognition of the additional impact they can have on reducing emissions.

4. Tilt the economics of everyday use - subsidise charging, while considering new, fairer, more progressive forms of fuel tax

Targeting the key costs of everyday use is one way to help to narrow the TCO gap between different vehicle types. It is also fundamental to switching out those ICE vehicles that are most highly used - not just any vehicles - to reduce emissions fast. To achieve this objective, governments should take a careful look at how they can tilt the variable costs between a BEV and an ICE - those that grow as the vehicle is used.

Although charging is already cheaper than re-fuelling an ICE, particularly where overnight, near-home charging is available, subsidies can further incentivise the switch to a BEV. This could be implemented swiftly and can be targeted at city drivers to tackle local emissions. The amount of any such subsidy increases the more that the car is used, bringing most value to high-kilometre drivers. Contrary to some concerns, such a policy does not encourage individuals to drive long distances if they are not already doing so. However, it is deliberately designed to shift the metric that really matters - not BEV ownership but BEV use.

Increasing the cost of driving an ICE is another core component of narrowing the TCO gap. Although increases in fuel taxes must be handled sensitively given their broad-based impact and potentially regressive nature, this policy lever already exists and is in technical terms easy to pull. It directly taxes harmful emissions and is perfectly targeted at high-kilometre drivers who consume the most fuel and so will have the most to gain by switching to a BEV to avoid the increased tax burden. It is therefore likely that new, fairer, more progressive forms of fuel tax will have a role to play in the future, coupled with subsidies on charging that are explicitly designed to make BEVs more attractive than ICEs. The balance (and budgetary impact) can be carefully calibrated to help all of society make the switch to BEVs, taking more and more people out of the fuel tax system altogether.

5. Introduce emissions-based road charging in cities

Taxing emissions via distance-based or access-based charges for driving ICEs in cities targets emissions reduction directly where they cause most harm. Notable examples include London's Ultra Low Emission Zone and Congestion Charge Zone, since both charges only apply to emitting vehicles. When applied equally to all drivers and with appropriate advance notice, such charges can be both a fair and effective way to incentivise drivers that regularly enter a defined area (a feature common among commercial drivers) to switch to a BEV. With levels of pollution

varying even within a city, this can have a significant and near-immediate environmental benefit by discouraging ICE use in the most densely populated and polluted urban areas. As a welcome by-product, road pricing has also been suggested as an effective way to encourage more efficient use of roads and higher-occupancy trips.[58]

In our view, this allows for a smoother transition to BEVs than a rapidly implemented ban on ICEs in city centres. With emissions-based charging, drivers remain able to use an ICE if it fits their economic circumstances, but there will be strong incentives for most drivers to switch. Consistent with the principles above, a full ban will ultimately be appropriate, but only once policies like this have created a system of price signals, strengthening over time, that have helped guide the great majority of drivers into a BEV well before the ban is implemented.

Case study: The environmental effects of 'return to garage' in Berlin

The preconditions for electrification in Berlin, and across Germany, are progressing well when compared to other European markets. Germany has invested heavily in electrification in recent years to reach its goal of having 10 million[59] BEVs on the road by 2030, with policy packages that significantly move the needle. Until 2025, for instance, consumers will benefit from a €9k[60] subsidy per vehicle, which reduces the upfront cost and alleviates a core barrier to BEV adoption. Likewise, BEVs are not subject to vehicle tax and will be exempt for the foreseeable future[61], while in many cities vehicles with an 'E' licence plate can park for free (or at a reduced price)[62] and can take advantage of other privileges, such as the use of bus lanes. These financial and non-financial privileges strengthen the appeal of switching to a BEV and begin to break down some of the obstacles.

In theory, partners on the Uber platform in Berlin are better placed than those in other European cities to take advantage of this public support. Unlike in other European cities, the private hire vehicle (PHV) sector in Berlin, and across the country, is characterised by fleet operators rather than individual drivers acting independently, with vehicles operating on a two or even three shift system and being kept in their place of business, a hub location for multiple vehicles. This allows for high use of vehicles as well as increasing the possibility of installing private charging for a large number of cars. In this sense, some of the barriers to BEV adoption described in this report may have a smaller impact on the PHV sector in Berlin.

However, outdated regulatory frameworks prevent fleet partners from capitalising upon this solid foundation for BEV adoption. The 'return to garage' (RTG) rule in Germany requires PHVs to return empty to their company's place of business after each trip, unless they have a follow-up order. This not only forces drivers into a long, empty, emitting trip back to base, but then also substantially increases the average distance driven empty to pick up the next passenger. This can result in many thousands of extra kilometres being driven without any passengers by one vehicle every year. Not only does this have poor environmental consequences, it also damages the economic rationale for shifting to a BEV. BEVs have a limited battery life and time spent charging means time off the road. This regulation means more hours charging for every kilometre carrying passengers when compared with other cities, increasing the opportunity cost of moving to a BEV. This is particularly the case where vehicles are used in a multi-shift model that gives less downtime in which to charge vehicles, weakening the potential for vehicles to be efficiently used. As a result, RTG makes it very difficult to use BEVs economically in a private-hire setting.

58. World Economic Forum (2019), Shared, Electric and Automated Mobility (SEAM) Governance Framework
59. Presse- und Informationsamt der Bundesregierung (2020), Verkehr klimafreundlich machen
60. Bundesamt für Wirtschaft und Ausfuhrkontrolle (2020), Neuen Antrag stellen/Nachweisportal
61. Presse- und Informationsamt der Bundesregierung (2020), Klimafreundliche, bezahlbare Mobilität
62. Allgemeiner Deutscher Automobil-Club e.V. (ADAC) (2019), Privilegien für Elektrofahrzeuge in Städten

With RTG in place, Uber and its fleet partners cannot electrify as quickly or effectively in Berlin as in other cities such as London or Amsterdam. This is despite the fact that other conditions in Berlin arguably better facilitate the switch. RTG regulations are environmentally harmful, both because of the unnecessary extra emissions created by drivers driving empty to and from base; as well as for their negative knock on impact on BEV uptake. We would suggest changes to this regulation across Germany, and encourage policymakers across Europe to consider how broader regulatory frameworks for the PHV sector can hinder or constrain operators' efforts to minimise their environmental footprint.

Impact on the cost of driving a BEV ↓ and an ICE ↑

The principles and recommendations outlined above would lower the cost of BEV versus ICE driving significantly. While the appropriate policy package would vary between European countries and cities, taking an approach akin to the one we advocated in this report will affect all high-kilometre drivers, regardless of whether they are ride-hail drivers, taxi drivers, delivery drivers or even private consumers. Our analysis (shown in the table below) suggests that by implementing a package such as this, it is possible to not only balance the costs of BEVs and ICEs for high-kilometre drivers, but to make BEVs the cheapest option for all urban drivers, commercial and consumer alike.

TCO of BEV vs ICE today	Ride-hail driver ↑↑↑↑↑	City car owner ↑↑↑↑	Rural car owner ↑↑↑
1. Ensure all high kilometre drivers can reliably access overnight charging at or near their home, where they would normally park	↓↓	↓	–
2. Stimulate the rapid development of an affordable / second-hand market for the kinds of long range BEVs starting to be sold new today	↓↓	↓	↓
3. Offer enhanced subsidies and weightings to those BEVs sold to and used by high kilometre drivers	↓	–	–
4. Tilt the economics of everyday use - subsidise charging, while considering new, fairer, more progressive forms of fuel tax	↓	↓	↓
5. Introduce emissions-based road charging in cities	↑↑	↑↑	–

| Future TCO vs ICE today	= BEV	↑↑ ICE	↑ BEV	↑↑ ICE	↑ BEV	= ICE
	BEVs likely to replace ICEs fast. Drivers make similar living in BEVs		Using BEVs - or public transport - is the best option		Protects rural communities. ICE driving costs are unchanged	

By implementing this green policy package, the TCO gap that exists today could rapidly reverse for ride-hail drivers, giving them a strong incentive to switch to a BEV. For private car owners in urban areas, it could be tuned to make driving slightly more expensive, helping to reduce the number of cars in cities; while for those that want or need to drive, ensuring that a BEV would be the cheapest option. Indeed, because these policies are directly focussed on cities where the impact of emissions is most acute, the potential impact on rural drivers is intentionally muted. This ensures those who live outside cities can continue to drive affordably, just as they do today.

A policy package like this would have an enormous environmental benefit. Critically, we believe that it can also be revenue raising for governments. While purchase and charging subsidies, and investment in charging infrastructure (where funded by public money) will be expensive, there will be many more ICEs than BEVs for the foreseeable future. Small increases in taxes on emissions / ICEs could more than cover these costs.

The impact of a comprehensive approach

We recognise that the policy measures taken across Europe will be adapted to local conditions. Subsidies for BEV purchase already vary widely between cities, for instance, while raising fuel taxes is a particularly contentious issue despite the environmental benefit, and in many countries it may not be politically acceptable. In some cities an emissions charge will be attractive, but the cost and practicalities of implementing and operating such a scheme will present specific local challenges. As such, this package is not intended to be a definitive solution that should be applied across Europe. Rather, it is a set of possible policy templates which will work well together to help tear down the barriers to BEV adoption.

The actions taken by policymakers will have a significant impact on BEV adoption over time. The illustration below is a simple simulation of how the impact of these policies could layer together. It is just one possible scenario, but in modelling how drivers might respond to changes in their relative earnings in a BEV or an ICE under different policy regimes, it seeks to demonstrate how policies can support one another in boosting BEV uptake. By taking measures to address each of the three barriers we identified, BEVs could become the most economical option, in which case ride-hail drivers would have a strong incentive to electrify.
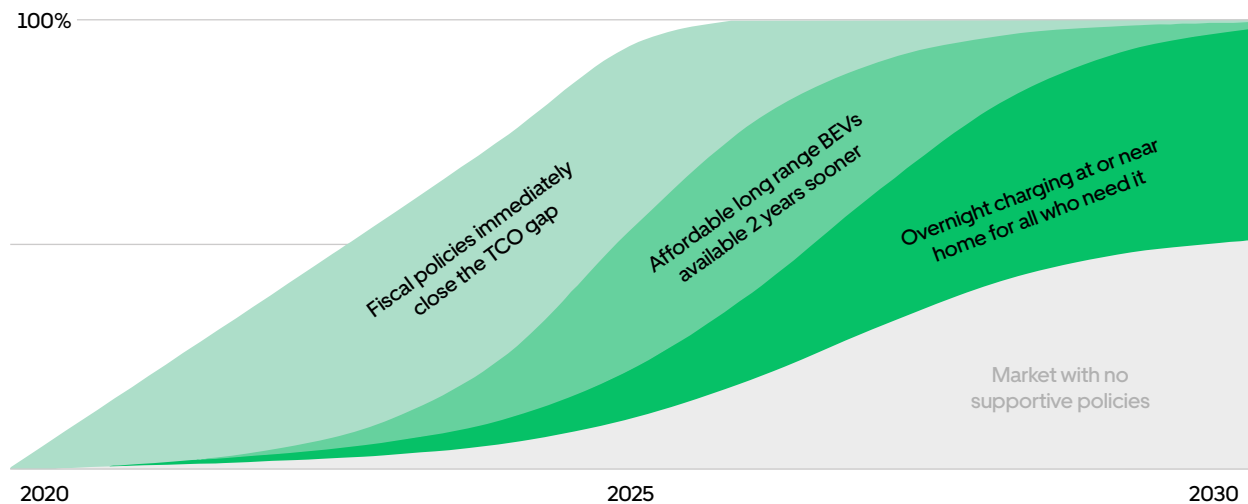
A simple model of BEV uptake in ride-hail with and without supportive policies

Ultimately, our recommendations can be distilled into three simple ideas:

1. Ensure that all drivers can access overnight charging at or near home to eliminate opportunity cost

2. Ensure that drivers can access longe range BEVs at a reasonable price, including on the second-hand market

3. Raise BEV subsidies (funded by ICE taxes) to close any remaining TCO gap and to ensure that drivers are no worse off than they would be in an ICE today.

While some cities such as Amsterdam (with overnight charging), London (via emissions-based road pricing) and Paris (by providing a large BEV subsidy) already have some elements in place, any government or city authority can implement forms of these policies that will significantly increase BEV adoption in the coming years.

This approach:

- ✓ Allows high-kilometre commercial drivers to still make a good living

- ✓ Can raise significant tax revenue for governments

- ✓ Discourages private ownership and use of fossil-fueled cars in cities

- ✓ Creates a cohort of BEV early adopters to stimulate investment in charging and create the economies of scale needed for electrification across society

- ✓ Dramatically accelerates the transition to cleaner, healthier, more liveable cities

If cities, ride-hailing companies, carmakers and charging operators all work together to create the right conditions, we believe that ride-hailing could then be electrified in any major European city within 5 years. This could act as a catalyst for change, driving a broader transition to BEVs and dramatically cutting emissions in cities across Europe. We cannot do it alone, but we know what must be done - and are fully committed to playing our part.