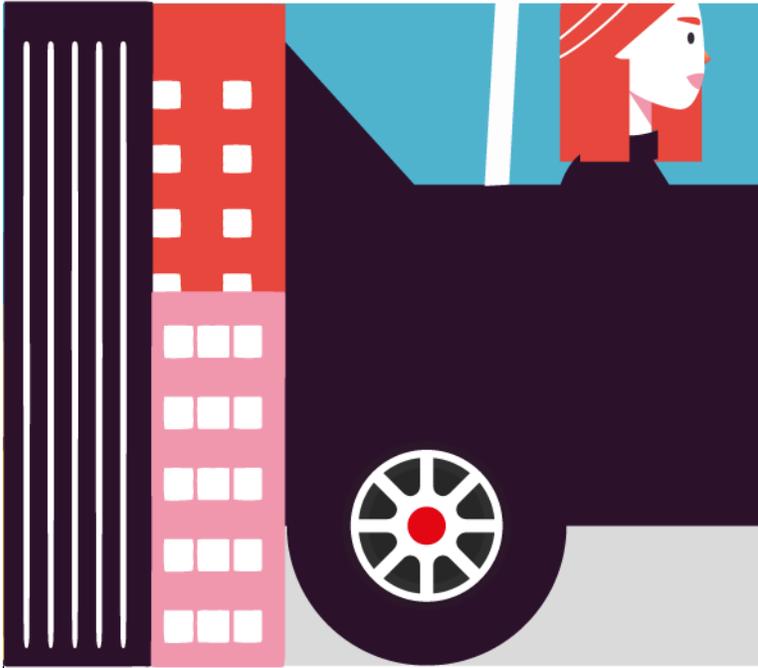


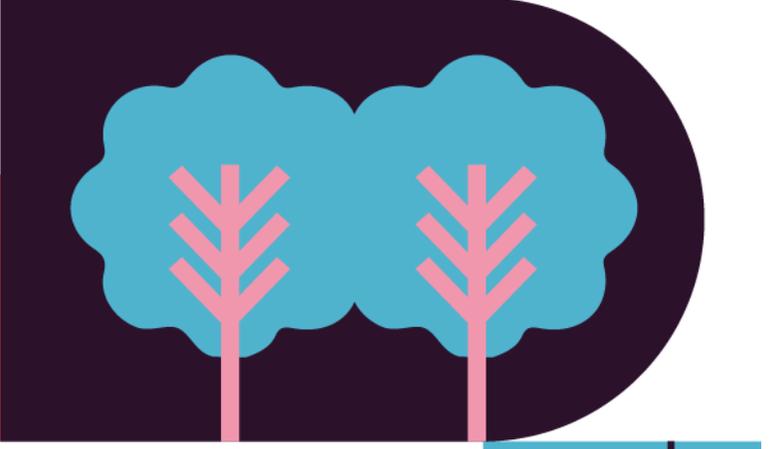
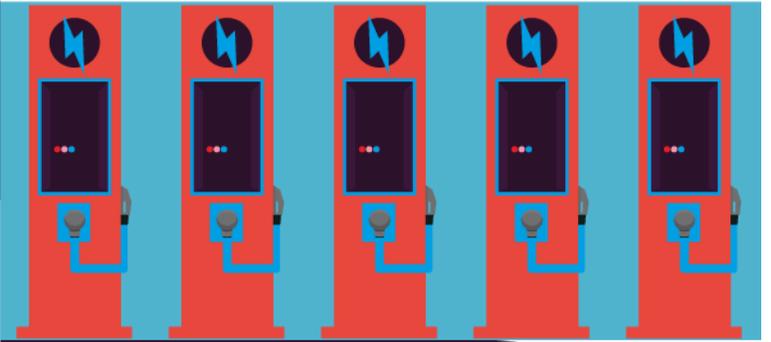
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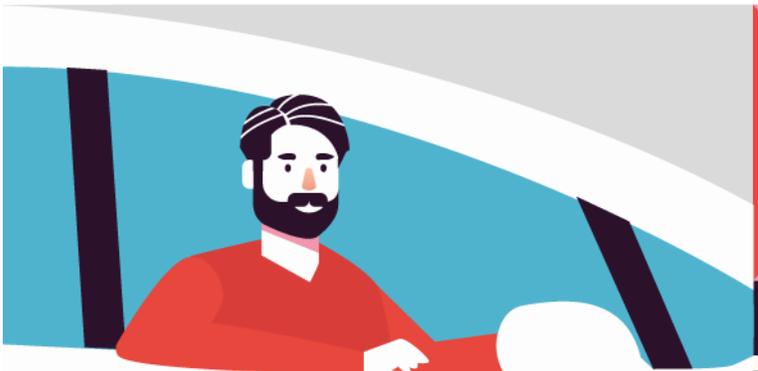
should go



electric



 **TRANSPORT &
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Analysis of the costs for ride-hailing electrification in Europe

Summary

The economic case to electrify high-mileage fleets such as ride-hailing services has reached a tipping point. As cities and nations announce bans on diesel and petrol cars, the offer of long range and affordable electric vehicles is growing rapidly thanks to the EU's car CO2 regulations that is taking effect in 2020 and 2021. For ride-hailing drivers, this means they can choose from a wider variety of better performing, and more attractively priced models which offer a superior driving experience and lower costs.

This paper shows that electrifying ride hailing services' will not only lead to substantial CO2 savings, but also means better economics for drivers across most vehicle segments in the five EU cities analysed¹. Looking at costs over the whole use time of the vehicle for a typical ride-hailing driver (so-called total costs of ownership - TCO), the overall result is clear: medium BEVs² are on average 14% cheaper to run than equivalent diesel, and up to 24% cheaper in Paris. Medium-size to large electric cars are the best option for drivers with access to home or depot charging in 12 out of 15 scenarios considered.

Access to slow **charging** is a key variable; the analysis finds that where drivers have the possibility to charge their EV either at home or at a depot, they can save up to €3,000 per year with an EV compared to an equivalent diesel car. EVs charging primarily at home or at a depot offer a better TCO across medium and large vehicle categories in almost all cities, with the exception of Brussels due to comparatively high EV purchase and public charging costs. However, drivers would be worse off in a scenario where they almost exclusively rely on public fast charging. These findings are consistent across all cities and clearly show that guaranteed access to home or near-home charging is crucial to maximise the TCO benefits of EVs. This is especially true for ride-hailing drivers, who unlike taxis don't have the option to either slow charge at a depot or fast charge at taxi ranks.

¹ Berlin, Brussels, Lisbon, Madrid, Paris.

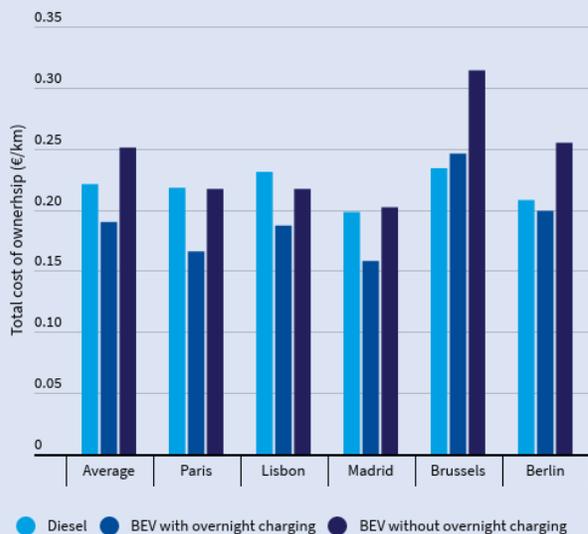
² In this paper, the medium category covers C-segment vehicles. The medium BEV is a Nissan Leaf 62kWh.

But the solutions are already readily available. To reduce costs of public charging for drivers, ride-hailing companies can and sometimes already do conclude agreements with charging point operators. As a ‘pool’ of frequent customers, ride-hailing EVs provide the much-needed demand that can boost the charging business model. Such negotiated discount rates for ride-hailing drivers can make the TCO of an EV reliant on fast charging already better than a diesel equivalent today, as is the case in Lisbon.

Cities have undoubtedly a crucial role to play in enabling a faster transition to EVs among drivers. Key measures include mandating taxi and Uber-like services to transition to full electric operations by 2030 at the latest, with a clear timeline and incentives helping the switch to zero-emission. To facilitate EV uptake, the creation of dedicated fast charging infrastructure is crucial, as well as support for home and slow on-street charging in residential areas. Furthermore, zero-emission zones in cities should be

introduced as part of the wider transition to emission-free mobility.

TCO of medium-size electric ride-hailing cars



On average for the five cities, BEVs with overnight charging are 14% cheaper while BEVs without overnight charging are 13% more expensive

Source: T&E in-house TCO modelling. 4 year ownership period, 60,000 km driven per year. BEV is a Leaf e+ and diesel is a Skoda Octavia. A 20% additional opportunity cost was conservatively assumed to account for the time lost during the day to fast charge when overnight charging is not available.

Beyond charging costs and city-level measures, **oil prices** and **taxation** are decisively impacting the TCOs: the analysis shows that for an identical vehicle category, depressed oil prices can lead to a worse EV TCO compared to diesel in Germany, while having little impact in others such as France. This illustrates that adequate fuel taxes and vehicle bonus-malus/feebate tax schemes are crucial to maintain favourable TCO for electric vehicles, especially in a context of low oil prices such as during the COVID19 pandemic. Similarly, post-COVID recovery packages such as those recently adopted in France or Germany offer further incentives for ride-hailing drivers to switch to EVs (respectively €7,000 and 6,000€ government bonus for the acquisition of a new EV and even more when an older car is scrapped).

Accelerating ride-hailing EV transition will also require platforms and driver associations to regularly share evidence and facts on total costs of vehicle use to help drivers make the most economical choice, not solely based on a narrow purchase price. This should happen on a larger scale than is the case today, through dedicated awareness-raising campaigns to ensure TCO are well-understood and taken into account before any new vehicle acquisition.

In order to lead the change and secure the framework needed for all their drivers to switch to EVs, Uber and other ride-hailing companies need to firmly commit to electrification in large European cities now. Such a commitment would be in line with many cities' strategies to ban the internal combustion engine, and would deliver short- & long-term benefits for ride-hailing companies and their drivers.

Ultimately, this clear commitment to zero-emission will also need to apply to other commercial fleets, including delivery vehicles and company fleets, which experience similar TCO structure and also account for a disproportionately high mileage on EU roads. Electrifying fleets is a win for all in Europe - air quality, climate, the EU Green Deal agenda and the automotive industry that has invested billions into Emobility already.

1. Ride-hailing services need to electrify in the next decade

Demand for ride-hailing services across Europe has been rapidly increasing over the past years. As a result, the number of private hire vehicle drivers working for ride-hailing platforms rose dramatically. In London, their number almost doubled from 49 854 in 2013 to more than 88 000 in 2018ⁱ⁾; in Paris, it went from around 10 000 in 2016 to about 30 000 todayⁱⁱ⁾; in Portuguese cities, licence volume tripled in 2019 to reach almost 20 000 PHV driversⁱⁱⁱ⁾. This poses a significant challenge in terms of increasing emissions and congestion (see part 1.1). Looking ahead, several converging forces require Transportation Network Companies (TNC)³, but also taxi and other high-mileage urban fleets, to fast-track their shift to electric vehicles.

The EU's climate neutrality objective by 2050 means that all new cars, currently responsible for 12% of all EU CO₂eq emissions and 44% of transport's CO₂eq emissions, need to be zero-emission by 2035 at

³ TNC covers application-based private hire services such as Uber, Bolt, Heetch, or Kapten. It is also referred to as ride-hailing in this report.

the latest. This is also in line with the EU Green Deal Strategy envisioning a pathway to zero-emission from 2025 on.

Because of their high-mileage and predominant operation in urban areas⁴ TNCs and taxis have a larger-than-average impact on CO₂ emissions (see part 1.1) and air pollution. Especially in countries with high diesel share such as France^{iv)}, where 90% of PHV drivers drive a diesel car, ride-hailing growth poses a public health issue on top of the climate one. For these reasons, it is crucial that ride-hailing services lead the shift to electrification and offer 100% electric services by 2025 in large cities, and by 2030 across Europe.

1.1. TNC electrification leads to higher than average CO₂ savings

Accelerating electric vehicles uptake among ride-hailing drivers is a priority to reduce emissions, as Uber-like services currently have a high carbon footprint in Europe. Analysis by Transport & Environment estimates that in its two biggest European markets London and Paris, Uber accounts for around half a megatonne of CO₂ per year.^{v)} This is equivalent to adding the CO₂ emissions of an extra 250,000 privately owned cars to the road.

Because of ride-hailing drivers' high mileage, CO₂ emission benefits of replacing ICEs with EVs are substantially greater than for the rest of the privately-owned fleet. TNC drivers' activity varies slightly across European cities but amounts to around 60 000 km per year compared to 12 000 km per year for an average European driver.^{vi)} Replacing a conventional TNC car with an electric TNC one brings up to 3 times more tailpipe CO₂ benefits than if an identical conventional private car was replaced with an EV - 85 tons CO₂ vs 30 tons CO₂ respectively.

The impact of EV's CO₂ emission savings over a vehicle's entire lifetime are illustrated in figure 1. The calculation is based on the life-cycle analysis tool developed by T&E^{vii)}, including upstream emissions associated with material extraction, battery value chain and manufacturing, vehicle assembly, and use phase. The lifetime of the vehicle considered for medium cars is 225,000 km over 15 years with the annual distance driven reducing over the years.^{viii)}

⁴ The IRU estimates that taxi services account for between 10 to 20% of vehicles kilometers in cities.

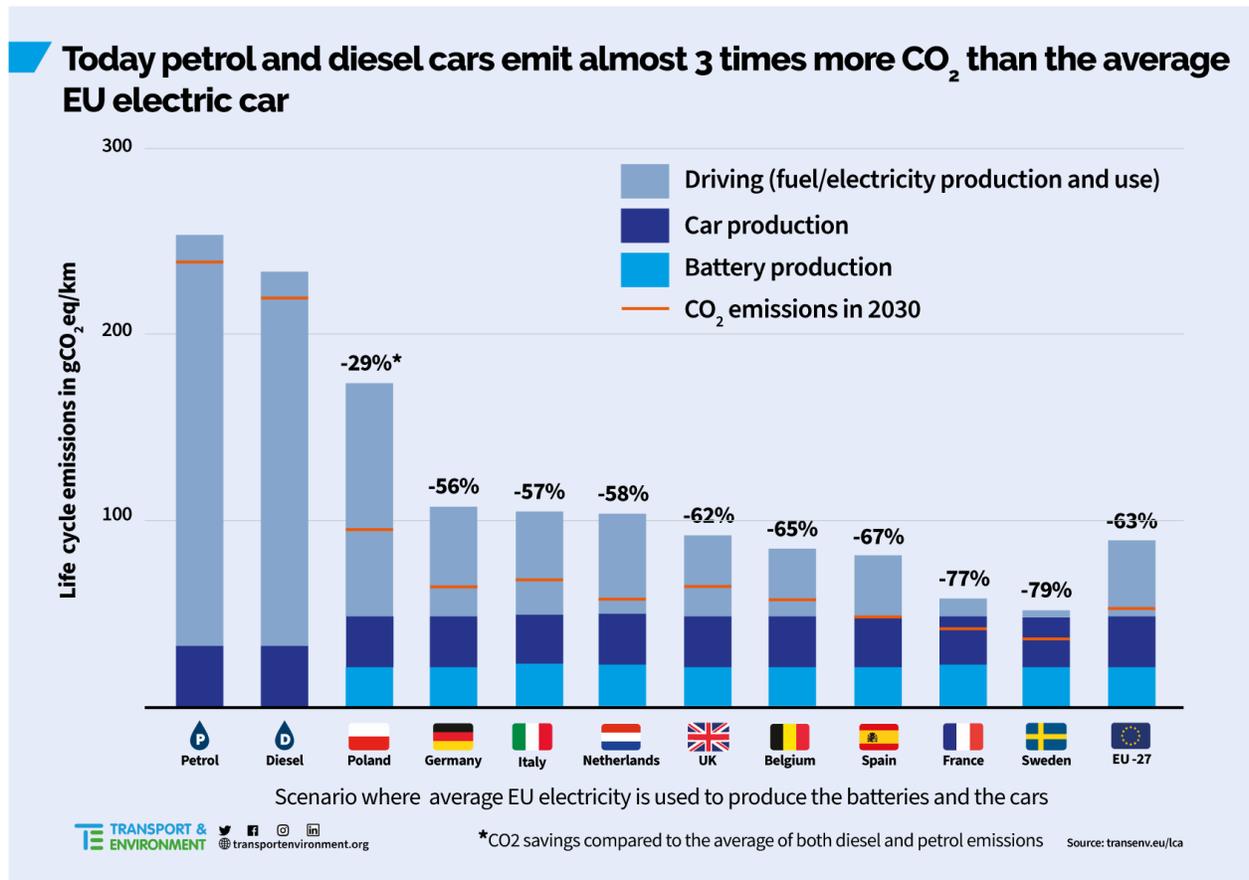


Figure 1: Tonnes of CO₂ emitted over the lifetime of a petrol, diesel, and electric cars

As shown above, EVs emit 63% less CO₂ over their lifetime than an equivalent diesel car. Because they drive between four to five times more than average drivers, CO₂ savings of replacing ICEs with EVs among TNCs are even greater (an estimated 85 tons of CO₂ saved over their lifetime, compared to 30 tons when replacing an average car).^{ix)}

1.2. Affordable and well performing EVs make the economics of switching stronger

Besides the climate goals requiring Uber-like services to rapidly shift to zero-emission vehicles, market dynamics are further strengthening the case for TNC electrification. Because of better economics due to lower running costs (see part 2), electric vehicles are an opportunity market player have to seize by helping their drivers switch to EVs. In the very competitive ride-hailing and

taxi markets in which drivers' and riders' satisfaction are equally important, higher running costs translate into poorer economics for drivers and higher fares for riders. For platforms like Uber, the internal combustion status quo means its ride-hailing app loses appeal in the mid-term.

Driven by the EU's 2020/21 CO₂ regulation and resulting favourable vehicle taxation, the EV market⁵ has seen unprecedented growth in the first months of 2020, as shown in figure 2.

While overall car sales were dropping due to the COVID19 pandemic, EV registrations in Europe reached a record one-tenth of new cars sold in March, and just under 7% for the first quarter.^{x)} Even on April data the conventional car sales dropped faster than the electric car sales, and Bloomberg NEF predicts^{xi)} the electric car market to contract less in 2020.

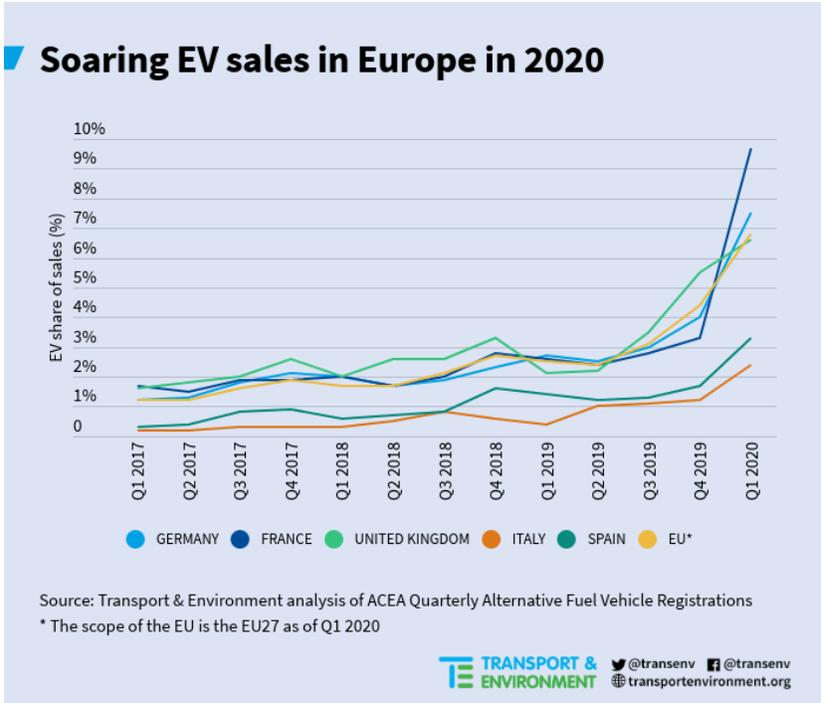


Figure 2 : EV sales in Europe, Q1 2017- Q1 2020

Importantly for ride-hailing drivers, the upward EV market trend comes along with a much wider choice of models in the larger C and D segments, usually preferred for taxi-like services. In 2020 alone, 33 new BEV models have already or are expected to hit the road.^{xii)}

2020 newcomers include following models:

- Volkswagen ID3 (Mid-2020, up to 600km range)
- Kia Soul EV (March, 450km range)

⁵ Considering both battery electric and plug in electric vehicles.

- Audi E-Tron Sportback (Spring, 450km range)
- Seat El Born (Summer, 418 km range)
- Polestar 2 (mid-2020, 500 km range)
- Tesla model Y (end 2020, 480 km range)

Looking ahead - if the right stimulus package is agreed post-COVID19 - the EV market will continue its dynamic expansion, reaching a 10% market share in 2021 (and potentially even higher if the overall car sales drop significantly in the ensuing recession). The yearly production of electric vehicles in Europe is expected to reach 3,5 million cars and vans in 2021.^{xiii)} By then, more than 200 different EV models will be available, offering a wide array of affordable and better performing vehicles, while ramping up the EV offer on the second hand market.

1.3. ICE phase out and city bans are adding pressure on TNCs

National and local measures aiming to tackle both carbon and pollutant emissions are increasing the pressure on high mileage urban fleets - including TNCs - to electrify. Setting a clear path towards zero-emission, several European countries have already announced their plan to phase out petrol and diesel car sales, notably Sweden, the Netherlands, Ireland by 2030, the UK by 2035 at the latest, and France and Spain by 2040.

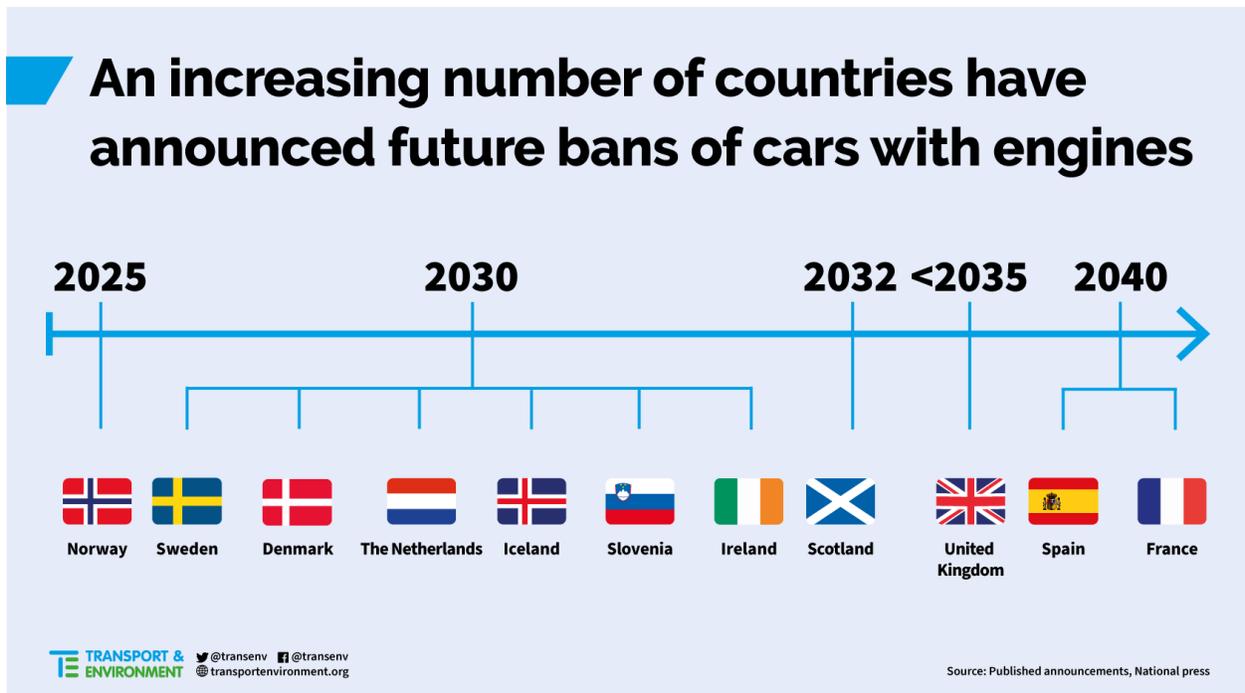


Figure 3: Petrol and diesel bans are spreading across Europe

At local level, more than 250 cities across Europe already have low and zero-emission zones in place in order to reduce air pollution caused by traffic. Air quality concerns over the contribution of Uber-like services to NO₂ pollution are most acute in Paris, where the overwhelming majority of drivers operate diesel vehicles (90% as per 31/12/2017 official data^{xiv}).

Cities are TNCs' operating environments and as such are the closest policy level to steer their operations, provided they are empowered by central governments to do so. This is for instance the case of London, which decided to introduce the ultra-low emission zone in parallel with its regulation of TNC vehicle emissions, prompting Uber's commitment to provide a full electric service in the British capital by 2025.

As COVID19 lockdowns are being lifted across Europe, cities are deploying strategies to avoid going back to pre-crisis pollution levels.^{xv} So-called 'tactical urbanism' measures aim at restricting the use of private cars in cities, giving more space to active mobility modes will potentially create a favourable environment for electric, shared on-demand mobility solutions.

The mounting pressure for ride-hailing services to electrify means the transition to EVs will be their social licence to operate. This was made clear in March 2020 in the run up to the Paris mayoral election,

with a few candidates including the incumbent mayor Anne Hidalgo explicitly calling on ride-hailing platforms to electrify.^{xvi)} And in European cities after lockdowns, once citizens have enjoyed cleaner air than usual, expectations towards high-mileage services like TNCs to clean up will be high.

2. Breaking down the costs of TNC electrification

Understanding the total costs of ownership of vehicles used for ride-hailing services is crucial in order to make the right purchase decisions and identify the nature and impact of different cost parameters on the overall drivers' economics. It is a key prerequisite for the design of sound sector-related policy measures, putting in place the right framework to allow for a socially just transition to zero-emission TNCs.

Whilst TNC drivers' TCO have already been investigated in the US context^{xvii)}, similar undertaking has so far been lacking in Europe. Thanks to its newly developed in-house TNC TCO model, this paper intends to fill this gap, bringing to light the nature of TNC economics in Europe.

T&E's TCO model has been developed using the latest available data inputs, based on publicly available sources as well as on interviews with drivers and with experts from the ride-hailing, energy, and public sectors.

Info box: What is TCO and why does it matter for TNC drivers?

People underestimate the total cost of owning a car by about 50%. This is the outcome of a survey conducted in Germany and published in Nature in April 2020^{xviii)}, illustrating car owners' very low awareness of their vehicle lifetime costs.

This is bad enough for households. But when your vehicle is your main work tool, this gets even worse. TNC drivers can drive up to five times more kilometres than an average driver. Their costs over the vehicle lifetime, once the car is either bought or leased, are therefore significantly higher. This is where the concept of total cost of ownership (sometimes referred to as total cost of operation for commercial applications) - TCO - turns out to be crucial.

TCO provides a full picture of all cost parameters, including capital costs (vehicle acquisition, depreciation, and resale value), electricity or fuel costs, insurance and maintenance costs, as well as

all applicable taxes and subsidies. In the case of EVs, home charging point installation and drivers' working time spent charging the vehicle - so called 'opportunity costs' - are also included in the TCO.

When working in a low-margin business such as ride-hailing, understanding one's own TCO is key to profitability. For self-employed drivers, a clearer TCO picture means a more rational vehicle choice, increased net revenues, and ultimately better living standards.

2.1 EV total cost of ownership are better in most use cases

TCO assumptions

This report looks at five European cities that are high-potential markets for TNC platforms but where a clear path to zero-emission TNC and taxi services is still missing: **Berlin, Brussels, Lisbon, Madrid, and Paris**. Alongside the TCO model, T&E has also interviewed 22 drivers, TNC platforms and taxi companies, city and utility representatives in six countries across Europe to test its assumptions in the real world.

The TCO model considers four different categories spread over three vehicle segments: The **access** category with more affordable C-segment cars for TNC drivers wishing to minimise upfront costs, the **medium** category with premium C-segment cars, the **large** category for D-segment, and the **premium** category for E-segment vehicles. A detailed overview of selected models can be found in the Annex. Vehicles selected for the model reflect ride hailing and taxi drivers' preferences. Brands include Toyota, Mercedes (especially the Toyota Prius, and the Mercedes C-Class and E-Class), Nissan (Leaf 40 and 62 kWh) and Tesla (Model 3 and Model S).

For this report, the model analyses an ownership period of four years, which is on the higher bound of the average ownership times for TNC and taxis, but is closer to the typical use patterns of EV drivers as reflected through the expert interviews (see Annex for more details). The model anticipates slightly lower insurance and maintenance costs for the BEVs (in relative terms) based on real world data collected by the New York Taxi Commission and on the Allianz Germany insurance cost calculator.^{xix)}

Fuel and electricity prices are all dated June 2019, corresponding to the latest available EU sources on residential electricity prices in Member States at the time of publication.^{xx)} While the COVID19 pandemic led to sharp drop in oil demand and to cheaper prices at the pump, some experts expect oil demand to get back to pre-crisis level toward the end of 2020.^{xxi)} Mid-2019 oil and electricity price levels are therefore a more solid basis to calculate the 4 year TCO. Detailed assumptions and input parameters to the TCO model can be found in the Annex.

Opportunity costs of public charging are also taken into account in the model. These costs correspond to costs incurred due to the losses of revenue from the time spent by drivers looking for fast chargers and waiting for the vehicle to charge. In the model, they are estimated to lead to a 20% increase in operation costs, although this would not apply to the same extent for all drivers. In fact, the reality of these extra costs vary largely depending on drivers' vehicle and daily routine. More than half the drivers interviewed for this report stated that they align their charging sessions with breaks they would take anyway during the day -like coffee breaks or shopping-, significantly reducing their opportunity costs. Such costs were even estimated to be close to zero by an expert from a Berlin-based TNC, so the TCO model assumptions regarding opportunity costs correspond to a conservative scenario. Looking ahead, opportunity costs are expected to decrease and eventually no longer be relevant anymore, as more dedicated fast charging infrastructure is deployed, making the charging experience seamless. Eliminating opportunity costs would reduce the TCO gap between home-charged BEVs and those mostly reliant on public fast charging from €0,06/km to €0,02/km.⁶

The addition of second-hand vehicle models and a more granular estimate of depreciation costs (same residual values were assumed across powertrains) would further improve the TCO analysis, but were not modelled here because of the lack of high-quality data available.

RESULTS

Results show that in 2020, BEVs with access to home, near-home, or depot slow charging offer a better TCO across the access, medium and large vehicle categories in almost all cities, with the exception of Brussels due to higher EV and public charging costs. The high upfront costs of the premium BEV make its TCO less competitive in all cities.

⁶ Medium vehicle category, average of 5 cities.

TCO: BEV vs. diesel		EU27	Paris	Lisbon	Madrid	Brussels	Berlin
With home charging	Access	-9%	-20%	-15%	-14%	13%	-6%
	Medium	-14%	-24%	-19%	-20%	5%	-4%
	Large	-13%	-17%	-25%	-14%	2%	-6%
	Premium	21%	19%	6%	25%	25%	38%
Without home charging	Access	21%	5%	-2%	10%	45%	22%
	Medium	13%	-1%	-6%	2%	34%	23%
	Large	13%	7%	-13%	8%	31%	20%
	Premium	55%	50%	25%	56%	58%	74%

Figure 4: in most cities, where home charging is available, BEVs are cheaper to run than diesel equivalents

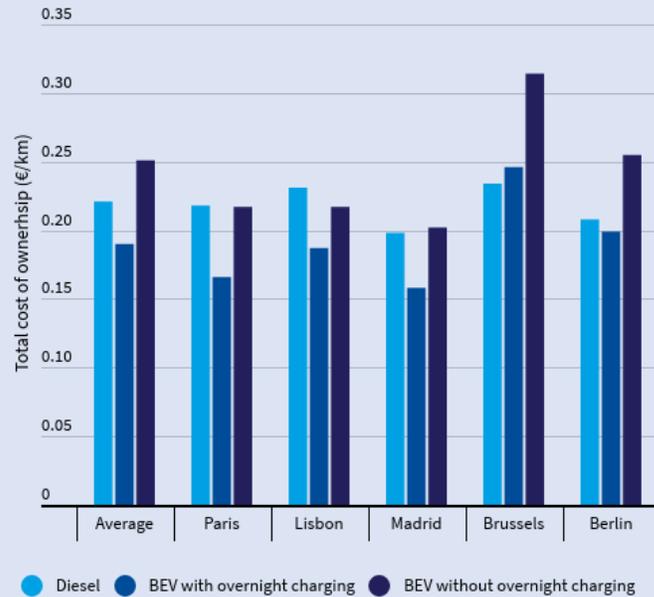
The overall TCO results are detailed below and highlight the impact of a few key parameters influencing the TCO, especially access to home charging as well as taxation and fuel and electricity prices.

2.1.1. Home or depot charging is a crucial TCO component for EV drivers

Charging is an important variable in the TCO model, directly impacting BEV drivers' costs during use phase. The model explores the impact of high reliance on home or depot charging (80% home or depot charging, BEV 1 scenario) and high reliance on public fast charging (80% fast charging, BEV 2 scenario). Because slow public charging does not really offer adequate solutions for TNC drivers, it was not considered in this model.

According to interviews with ride hailing drivers and platforms, drivers can drive up to 300km a day. This means that in the premium C and in the D and E segments a fully charged battery covers the range required for an entire shift. For drivers without home or depot charging, we assume they will need to fast charge during their shift once a day for an hour on average to replete their batteries from 20% to 80%.

TCO of medium-size electric ride-hailing cars



On average for the five cities, BEVs with overnight charging are 14% cheaper while BEVs without overnight charging are 13% more expensive

Source: T&E in-house TCO modelling. 4 year ownership period, 60,000 km driven per year. BEV is a Leaf e+ and diesel is a Skoda Octavia. A 20% additional opportunity cost was conservatively assumed to account for the time lost during the day to fast charge when overnight charging is not available.

Figure 5: TCO for BEVs with overnight charging are 14% cheaper on average in the five cities

Results are consistent across all five cities and show that in the medium-sized vehicle categories, which is most relevant for drivers, BEVs with access to home charging are the best value proposition, with the only exception of Brussels where the BEV TCO is still slightly more expensive.

One of the most striking results of the TCO model is the impact of home charging on the total costs of operating a BEV for TNC services. This is exemplified in figure 5, where BEV 1 assumes a TNC

driver is able to charge their vehicle at home, relying solely on this option to charge the car. The BEV 2 scenario assumes the same vehicle (in this case a Tesla model 3) relying on 80% public fast charging. This results in the BEV 2 TCO being €0.02 per km more expensive than for BEV 1 (€1200/year), and if opportunity costs are factored in the BEV 2 TCO lie €0.06 above the BEV 1's (€3600/year).

Over-reliance on public fast charging completely turns the BEV's TCO benefits around, making it the most expensive option. In this case the BEV becomes €1,800 more expensive per year compared to the diesel equivalent (or €0.03 more/km), whereas its yearly costs are €1,800 cheaper if home charging is available (€0.03 less/km). The substantially higher costs of fast charging compared to home charging (around €0.45/kWh vs €0.22/kWh on average in the five cities) highlights the need to rapidly increase home chargers' availability among TNC drivers.

Taking into account opportunity costs, the TCO of BEV drivers relying mostly on fast charging further increases, making it less attractive for TNC drivers.

It is important to stress that not having access to home charging does not necessarily lead to high opportunity costs for drivers in terms of time wasted, who can charge during their break time. For instance, a one-hour break spread during the day could allow a driver to charge about 35 to 40 kWh at a 50kW charger, enough to gain about 200km additional range.

Beyond TNC drivers who are self-employed and cannot use a depot (e.g. during breaks or cleaning) in the same fashion as taxis, these findings show that the business case for switching to BEVs among taxi or PHV companies owning several vehicles is already there. Using their depots to slow charge the vehicles when not used, taxi companies can benefit substantially from transitioning their fleets to BEVs and equipping their depots with slow chargers.

Overall, across the five cities, the TCO model shows that home/ depot-charged medium-sized BEVs are between €600⁷ more expensive to €3,000⁸ cheaper per year compared to diesel equivalents.

2.1.2. Fiscal incentives and the TCO tipping point

⁷ Medium vehicle category, Brussels.

⁸ Medium vehicle category, Paris.

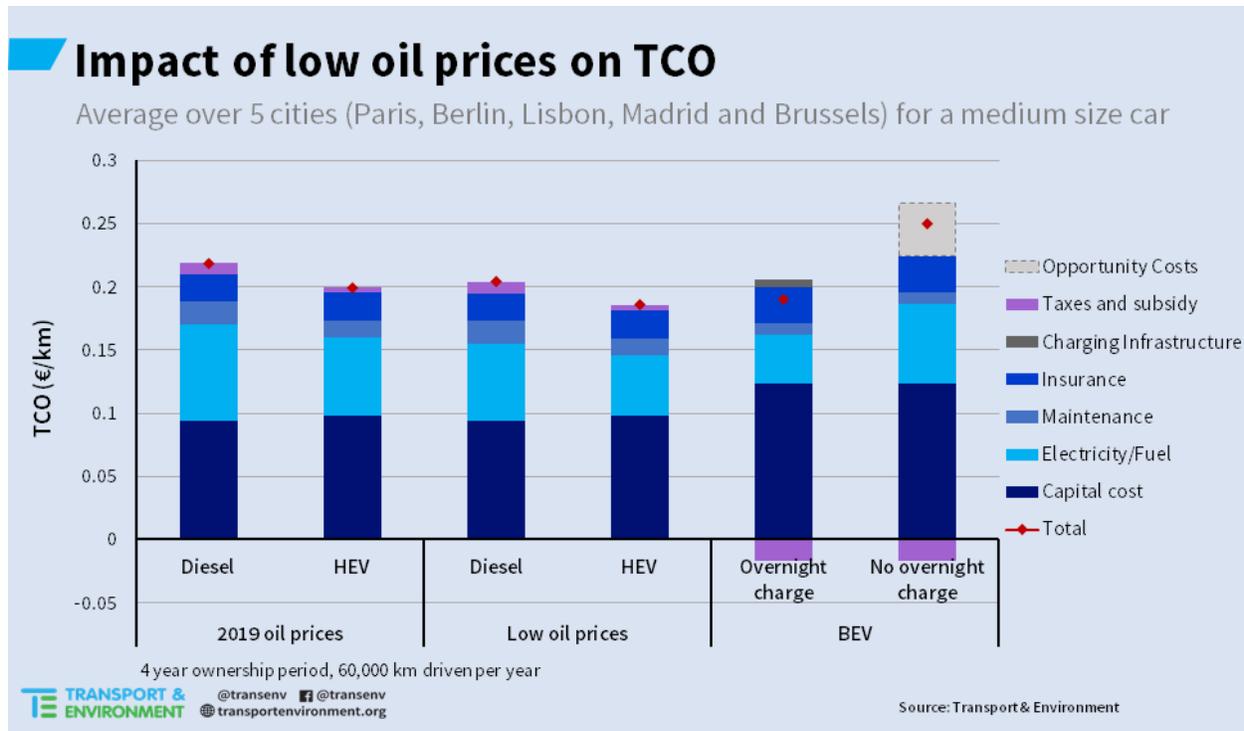


Figure 6: Impact of low oil prices on TCO

In addition to access to home charging, fuel taxation and subsidies (purchase subsidies, registration taxes, and circulation taxes) play an important role in tipping the TCO in favour of BEVs (purple bar called 'Taxes and subsidies' in the graph). It is especially true in the case of more affordable vehicles where electricity and fuel costs account for a large part of TCO.

This is shown in figure 6 which compares average TCO of diesel, HEVs and BEVs, taking into account a low oil price scenario as is the case worldwide since the COVID19 pandemic broke out. Such prices are however not expected to last over the whole four-year time TCO period as expected to bounce back at least partially once the economic activity resumes post lockdowns.

In this example, COVID19 crisis-level fuel costs mean that a TNC driver of a medium category vehicle would almost lose the TCO benefits of operating a BEV compared to an equivalent diesel vehicle (€0.01 less/km compared to €0.03 less/ km usually).

This highlights the importance of fuel duties in the event of prolonged depressed fuel prices, as letting prices slip could send the wrong incentives for high mileage drivers and slow down the shift to zero-emission powertrains.

Similarly, phasing out existing VAT exemptions on fuel for taxi and private hire vehicle services - where these still apply - will provide an additional incentive for drivers to switch to EVs.

Looking at specific city cases, the example of Paris in a low oil price scenario shows that a mix of high fuel tax, relatively low home electricity costs and effective BEV support schemes ensures stable TCO results across the different powertrains, with the BEV remaining the most economical option, provided home charging is available (€0.03/km cheaper than diesel vs €0.05/km usually). On the contrary, low oil prices in Berlin turn the €0.01/km BEV benefit over a diesel equivalent into a €0.01/km additional cost.

2.1.3. TCO varies considerably across segments

Depending on the type of vehicles they want to drive, all ride-hailing drivers won't have the same TCO benefits of switching to BEVs at the same time, depending on upfront vehicle costs and annual mileage. As TNC drivers in Europe have to be professionally licensed, only a minority of them work part time, meaning that the overwhelming majority are all high mileage drivers.

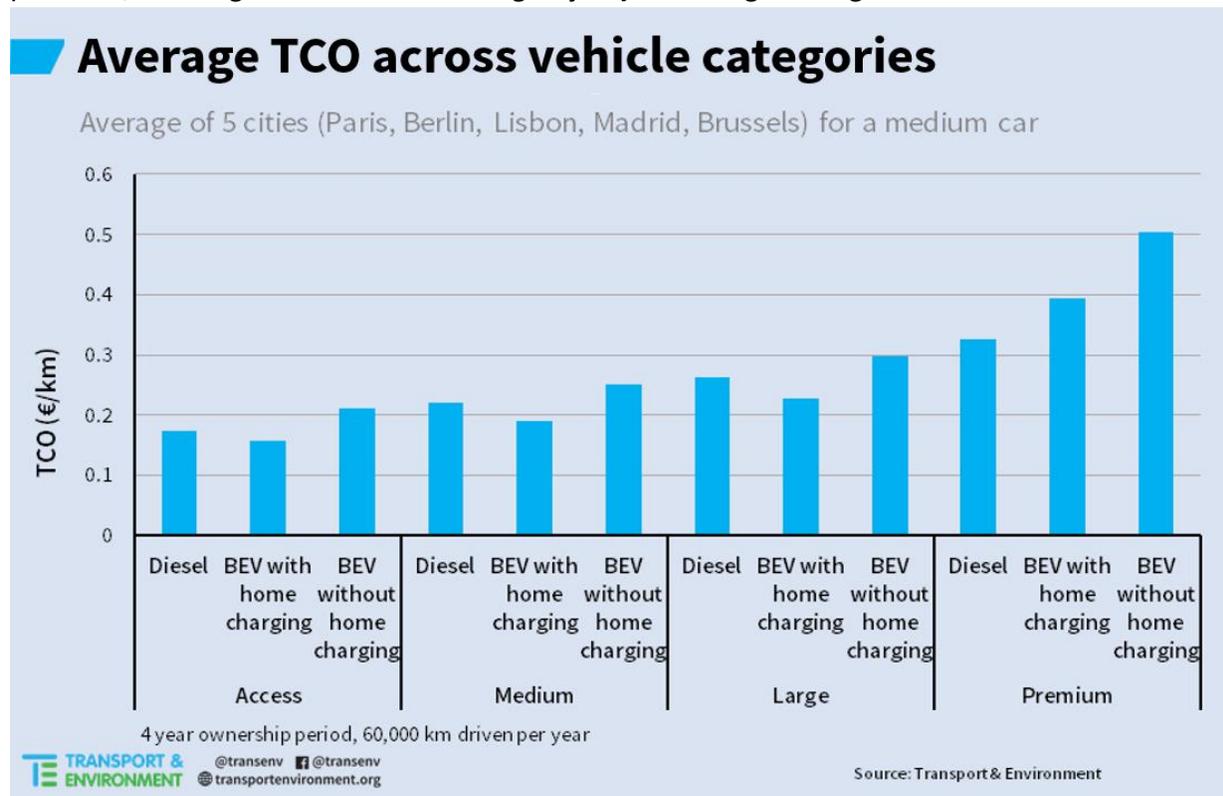


Figure 7: Average TCOs across vehicle categories

However, vehicle choice can be impacted by local regulation, as is the case in Brussels for instance, where the regulation imposes minimum price of and vehicle size requirements for TNC drivers.^{xxii)}

Brussels-like vehicle requirements incentivise the acquisition of larger and in some cases premium vehicles, whose high price tag currently does not offer the best TCO for BEVs as illustrated in figure 7. The TCO model clearly shows that higher upfront costs of the premium BEVs (€87,800 compared to €53,482 for the diesel equivalent) cannot be completely offset during the use phase.

The variation of TCO across segments and use cases is important to take into account, and TNC vehicle regulation should avoid imposing criteria that incentivise the use of larger polluting vehicles, when these criteria are neither justified by social nor by environmental considerations.

2.2 The role of TNC platforms in supporting EV uptake

TNC platforms such as Uber, Kapten, Bolt, or Heetch have a crucial role to play in supporting EV uptake among their drivers. As the intermediary between riders and drivers, platforms can introduce the right price incentives to favour EV rides among polluting trips. And because they aggregate a large number of drivers on their app, they can secure cheaper charging rates for EV drivers as well as lower vehicle upfront costs. Section 2.2 provides an overview of what TNCs can do to support their drivers' transition to EVs.

2.2.1. Reducing charging fees and opportunity costs

Several ride-hailing platforms - e.g. Uber, Bolt, or Kapten - with electric vehicles on their apps are exploring partnerships with charging point operators to offer better deals for their drivers. This is for instance the case of Uber with Power Dot in Lisbon (see figure 6). The agreement reached by both companies enables Uber drivers to charge for €0.15 per minute, meaning that public fast charging prices for e.g. a Nissan Leaf 40kWh (the most popular EV among TNC in Lisbon) are almost aligned (or even cheaper) to home electricity prices of €0.20 per kWh.

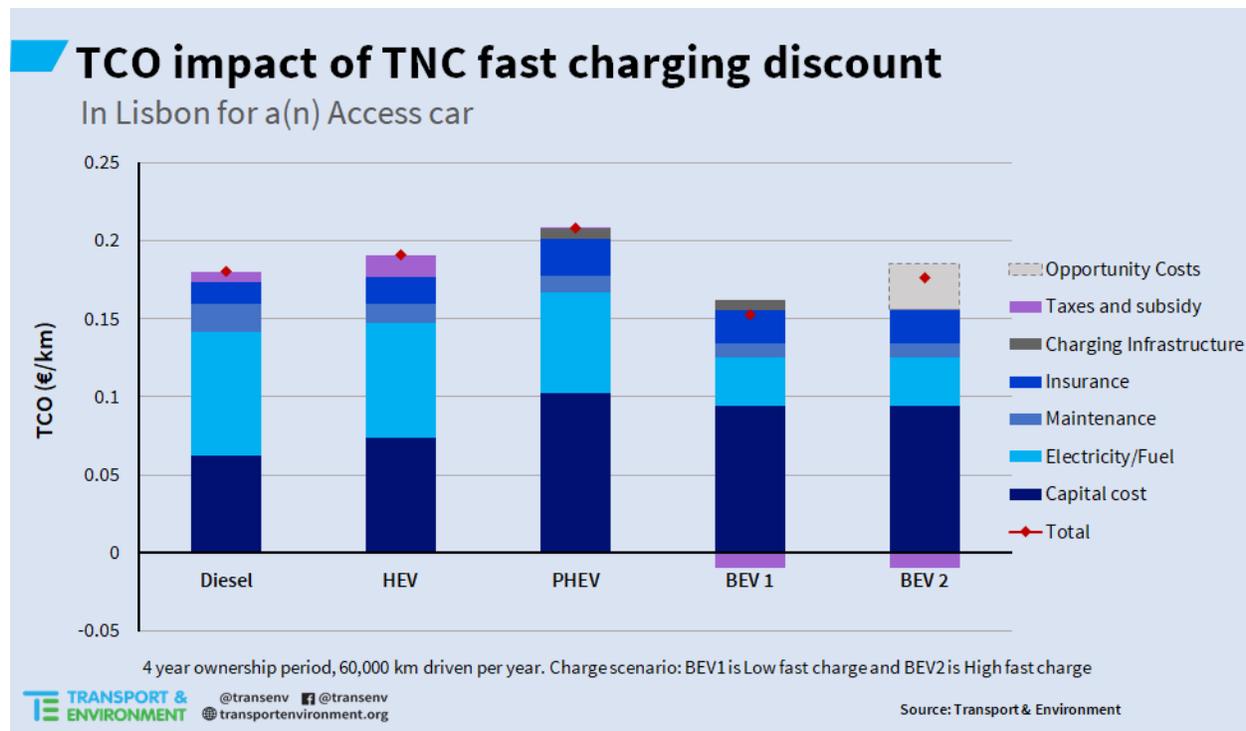


Figure 8: TCO for the access category in Lisbon, where Uber collaborates with Power Dot on fast charging.

Figure 8 shows the TCO impact of the Uber/ Power Dot agreement for drivers: independent from home charging availability, and even factoring 20% opportunity costs, the BEV TCO are at worst equally advantageous (BEV 2 compared to diesel) or more advantageous than all other powertrains in the access category. Replacing the partnership fast charging tariffs with the average fast charging price in the four other cities (€0.44/kWh), the BEV 2 TCO would be €0.03/km worse than the diesel's TCO.

This finding demonstrates that such collaboration should be pursued and replicated across all five cities to reduce the TCO gap induced by lack of home charging, which is currently a barrier for wider BEV uptake among TNC drivers.

2.2.2. The role of direct platform rewards and TCO education

In order to incentivise their drivers to acquire BEVs, ride-hailing platforms should offer direct rewards to their drivers who opt for EV and increase their overall TCO awareness. Below are a few examples that should be replicated by TNCs in all cities they operate in:

- **EV purchase agreements with OEMs:** The largest TNC platforms in Europe such as Uber, Kapten, or Bolt can negotiate discounts with carmakers, whereby drivers can buy or lease BEVs at cheaper rates. This was the case for instance in London between Uber and Nissan, for the acquisition of the Nissan Leaf. Expert interviews suggest these discounts can typically range from 15% to 20%, substantially reducing upfront costs for TNC drivers. With the 2020/21 CO₂ targets kicking in this year, such agreements are also in the interest of OEMs, who can benefit from large EV sales channels to meet their CO₂ targets.
- **EV acquisition bonus:** In London, Uber is helping its drivers - provided they fulfil conditions related to number and quality of rides completed - with up to £4,500 for the acquisition of an EV through the so-called Clean Air Fund. This fund is levied from a 15 pence per mile surcharge on all London rides. This represents an effective and equitable way to support drivers to switch to EV cars without incurring private costs.
- **Energy cost compensation and charging credit:** Some TNC platforms interviewed for this paper offer their drivers €250 per month in energy compensation costs. While this does not cover half the diesel costs for a month, it more than makes up for electricity charging costs which were reported to be on average €110/month. This means EV drivers can increase their net revenues by an estimated €1,680/year via this scheme.⁹ Other TNCs offer so-called charging credits, where their EV drivers benefit from a €50 monthly allowance to fast charge on a specific partner network.
- **EV in-app rewards:** TNCs can include EVs in both the standard ride option and in the EV-only or 'green' option, meaning EV drivers can source rides from two pools of riders, making the switch to EV more attractive. On top, some platforms offer €2 bonuses per EV ride, or £10.50 bonus per day for EV drivers only.
- **TCO education:** TNC drivers may lack vehicle knowledge or taxi-sector experience, and may not always be aware of all cost parameters they need to take into account. Drivers tend to undervalue future spends compared to present ones (so called discount rate¹⁰), which leads them to undervalue the fuel savings from switching to EVs. This is the reason why TNC platforms, in collaboration with drivers' associations such as the Vague pour la Transition Écologique (VTE)

⁹ This estimates 5€ electricity charging costs per day, 264 working days a year.

¹⁰ In this report T&E uses a discount rate of 4%.

in France, should intensify drivers' education initiatives. This should include seminars and drop-in sessions to explain the TCO and answer drivers' questions, as well as giving drivers access to a user-friendly TCO calculator they could use to calculate their expected TCO before making a purchase or lease decision.

All these measures can influence drivers' choices and accelerate the transition to zero-emission ride-hailing. But scaling up this transition will require enhanced cooperation between cities, governments, and platforms to overcome the status quo.

3. Changing the economics of the status quo: a framework for electric ride-hailing

As part 2 has shown, the economics of electric ride-hailing are already better today across most segments and in most of the five cities analysed. But a few roadblocks remain that need addressing in order to accelerate TNCs transition to zero-emission operations.

3.1 Infrastructure deployment

The TCO model does not provide information on the availability and quality of home, public, or semi-public charging, it only breaks down the cost impacts of different options. Interviews with TNCs professionals (Platform representatives and drivers alike) all point out shortcomings related to the type and number of charging points available where they operate. This is an area where EU, government and cities support will be needed, especially in post-COVID 19 recovery times when private investments might dry up.

A first takeaway from both the interviews and the TCO model is that in all cities, access to home charging is a crucial factor in determining the switch to EV model and needs to be facilitated. For instance, in Paris, a TNC Platform reported that more than half their EV drivers do not have access to home charging. Against this background, and as highlighted already by T&E in its January 2020 report on infrastructure^{xxiii}), accelerating the cabling and preparation of residential (and workplace) buildings should be a priority of the EU Green Deal agenda. In parallel, an EU-wide right to the plug should be instituted to ensure that EV drivers - either owner or tenant - wait no longer than three months to get a charging point installed from the point of making a request. This should go hand in hand with a funding programme to cable buildings and upgrade grids where necessary, aiming at a fifth of buildings cabled

in 2025 and half in 2030. This will create jobs and can be combined with the upcoming building renovation policies as part of the post-COVID recovery.

Several EV TNC drivers indicated they often charge on semi-public locations such as shops or parking lots. For this reason, charging infrastructure of 50kW and higher should be rolled out on commercial properties including large shops, leisure and sports facilities with parking facilities, as well as petrol stations. These are convenient places where drivers can combine charging with a break, reducing opportunity costs. This would also help alleviate the need for every driver to have a dedicated charge point in urban areas. To accelerate rollout across Europe, minimum deployment targets and financial support should be introduced for chargers on parking spots of medium and large commercial properties - aiming for a fifth to be equipped by 2025 and half by 2030. The upcoming revision of the main EU legislation on infrastructure - the Alternative Fuels Infrastructure Directive (AFID) - should urgently address these points.

At city-level, fast charging hubs for high mileage urban fleets like taxis and TNCs should be created, as these vehicles are more dependent on fast charging infrastructure than regular EV drivers because of higher utilisation rates and longer driven distances. Busy locations such as train stations, airports, and conference centres should be considered as primary locations for the nearby installation of such hubs. Importantly, procedures to enable grid upgrades where needed for the installation of charging points need to be fast tracked, as the installation process can currently last up to two years.¹¹ To avoid disruptions, cities should seek to combine charging infrastructure installation with grid reinforcements and/or with other works planned.

Importantly, post-COVID 19 recovery plans need to foresee targeted support for installation of charging infrastructure, including in commercial or private buildings, focusing on cabling but also providing wallboxes for less well-off drivers.

Major pan-EU charging infrastructure projects should be ramped up to connect all major EU roads, as well as to equip cities with fast charging hubs to enable, shared, public and corporate fleets to charge easily. This should also include the roll-out of public high-power chargers for commercial vehicles, as a first step around the 88 nodes and the core network of the TEN-T. As part of the upcoming review of the AFID, the EU should set ambitious overall targets for the number of HDV charging points it plans to roll out by 2025.

¹¹ According to interviews with a Berlin-based DSO.

TNC drivers already driving EVs report using instant messaging services to share information about charging point availability on public and semi-public locations, to minimise the time spent waiting for the infrastructure to be available. Such mechanisms should be scaled-up and provided by platforms, for instance with an in-app function for EV drivers indicating the nearest charging point location and status. To support their EV drivers, some platforms have created so-called charging ‘campuses’ or ‘hubs’ with exclusive fast charging access to their drivers. This should be encouraged before wider infrastructure rollout happens, enabling more convenient charging by all drivers, but cannot on its own substitute the need for more adapted home, semi-public, and public infrastructure.

3.2 Market design and urban access regulations

Cities are the main operating environment for ride-hailing drivers, and their taxi and TNC regulations, as well as access restriction policies, directly impact drivers’ economics.

Ambitious Ultra Low Emission Zones like the ones in London or in Lisbon provide strong incentives to economic actors - either in the form of a surcharge that most polluting vehicles must pay (London) or in the form of a ban on certain types of vehicles. In the case of Lisbon, the city had announced before the COVID19 pandemic its plan to allow access to the city centre only to zero and very low emission vehicles. Even if only restricted to the city centre, the measure would strongly encourage TNCs to operate only full electric vehicles, since in Europe city centres act as a magnet for TNCs, with the large majority of trips either starting or ending in these areas.

TNC’s response to both measures has been quick: platforms are boosting collaborations with OEMs to source EV cheaper, and also team up with Charging Points Operators so that their drivers can fast charge cheaper.

As the main operating environment for ride-hailing, cities should be given the necessary competencies to regulate both the taxi and TNC market. With the exception of London - which enjoys more powers to regulate the sector than the other cities analysed, this is slowing down progress toward electrification. For example, the city of Paris cannot impose emission criteria on TNCs, nor can it limit the number of licenses allowed to operate on the city’s territory. The competence to do so would accelerate the sector’s electrification while giving cities the responsibility to ensure the necessary charging infrastructure is adequately deployed.

Likewise, a better control of TNC licensing by cities would allow the extension to TNC of existing taxi EV subsidy schemes - in Paris a premium of up to 6,000€ for the acquisition of a new EV used as taxi.^{xxiv)}

As part of post-COVID19 recovery measures, governments should roll out dedicated support schemes for the lease or purchase of electric vehicles used in high mileage fleets such as taxis and TNCs. This can take the form of fiscal incentives such as tax exemptions, or direct subsidies when replacing an old polluting vehicle with an EV used for such services. The EU can also provide such support and should do so as part of their EU Recovery Fund designed to relaunch the economy, including the automotive industry.

Beyond cost-related measures, cities and governments can provide soft incentives for taxi and TNC drivers to electrify. For instance, electric TNC should be allowed to use bus corridors or to park near busy locations such as train stations, instead of driving empty while waiting for a ride. In Munich, electric taxis are allowed to skip the queue and so can maximise profitability. Similar privileges should be replicated across cities where these services are sought after.

Info box: city-level policies to facilitate electric ride-hailing

Cities have a crucial role to play in accelerating the transition of ride-hailing services to EVs, as TNC drivers in Europe almost exclusively operate in urban areas. In particular, city-level policies should focus on:

1. Phasing in **zero emission licencing mandates** for any new taxi or private hire vehicle, with a clear timeline toward emission-free fleets by 2030 at the latest.
2. Deploying **fast charging at taxi ranks and dedicated ride-hailing hubs**. Charging point installation should be simplified by streamlining installation and grid upgrade procedures.
3. Ensuring charging infrastructure is installed where mostly needed and used, especially in residential areas such as slow off-street and on-street charging.
4. Alongside national support, incentivising the **purchase of zero-emission** vehicles for both taxis and PHVs, for instance through direct bonuses.
5. Granting in-kind incentives to electric ride-hailing drivers, e.g. extending their parking rights and allowing them to use bus lanes. Electric taxis should be allowed to skip the queue at taxi ranks.
6. Making widely available and free of charge data on where the closest public or semi-public charging infrastructure is or will be located, as well as the type of infrastructure (to be) installed.

7. Introducing vehicle access regulation for polluting vehicles (diesel, petrol or gas) on the city's territory, and zero-emission zones in the city centre.

With the right policies in place, cities can enable EV drivers to operate more efficiently and economically in TNC fleets.

Where barriers still exist today, governments should grant cities the right to enact the above policies, as this will enable the creation of the right environment for zero-emission ride-hailing.

3.3 The impact of TNCs commitment to electrification

Besides regulation, a commitment by Europe's largest TNC would fast forward the shift to EVs in the sector, and clear the remaining roadblocks to the mainstreaming of EVs among TNC drivers and riders alike. It would send an unequivocal message to cities and charging point operators that high mileage EVs are coming to the streets.

A clear pathway to zero emissions, similar to what Uber has committed to in London with the use of 100% EVs by 2025, would create a pool of users for (fast) city charging infrastructure. Such an announcement would unlock the current gridlock whereby the lack of charging infrastructure is still deterring some TNC drivers from shifting to EVs. As interviews with CPO and grid operators made clear, demand and utilisation certainty are key to any deployment of charging infrastructure, especially fast charging where upfront costs are higher. In this regard, high-mileage EV drivers will improve the business case for public and semi-public charging infrastructure providers. This can already be witnessed in Amsterdam, where 60% of fast charging sessions are due to taxis.^{xxv)} Similarly, London expects that by 2025, 70% of the fast charging users will be TNC drivers.^{xxvi)}

As shown by the TCO model, a planned and anticipated shift to EVs will benefit TNC drivers who can save more driving an EV than a conventional vehicle, provided they have access to home charging or do not pay the standard current fast charging rates. Drivers usually work with several TNC apps but will prefer the one providing wider customer-base and best net revenues per trip. Because ride-hailing users favour EV options over more polluting ones^{xxvii)} TNCs that anticipate the transition to electric vehicles will manage to increase drivers' satisfaction, which is essential to TNC platform's attractiveness and financial sustainability.

From both the economics and the corporate responsibility sides, a commitment to 100% electric rides in large EU cities would be a strategic choice for Uber, unlocking wider benefits for society as a whole.

4. Conclusion: TNCs must and can go electric

The transition to electric TNC in Europe is both needed to reach climate neutrality objectives, and economically sound for drivers. As cities and governments across Europe are banning petrol and diesel cars, the question is not *whether* TNC electrification will happen but *when*. The answer will depend on strategic decisions by TNC platforms, drivers' awareness, and cities' electrification strategies.

This report shows that next to substantial CO2 emission savings of replacing an ICE by an EV used for ride-hailing (85 tons of CO2 saved over the vehicle lifetime, compared to 30 tons for an average car), TNC electrification makes economic sense for drivers across most vehicle segments in all cities analysed. Where home charging is available, TNC drivers can save up to 3,000€ per year by driving an EV rather than an equivalent diesel car. TNC platforms and driver associations need to share these facts transparently with drivers through dedicated awareness-raising campaigns to ensure TCO are understood and taken into account before any new vehicle acquisition.

To accelerate TNCs transition to electric powertrains, facilitating the installation of home chargers is crucial as the ability to home charge is often tipping the overall TCO clearly in favour of EVs. In parallel, fast charging infrastructure should be rolled out where the business case is most straightforward. This means chargers' deployment on commercial properties and fast public charging made available at busy city locations (airports, train stations) and touristic attractions or event centres.

In order to lead the change and secure the framework needed for all their drivers to switch to EVs, TNCs - and Uber as the most prominent in the EU currently - need to now firmly commit to electrification. Beyond Uber, this paper shows that the economics is already there so TNC and taxis must transition to zero-emission by 2025 in large European cities of at least 500,000 inhabitants; and by 2030 at the latest all across the EU.

This clear path to zero-emission for the next decade will also need to apply to other commercial fleets, including delivery vehicles, which experience similar TCO structure and also account for a disproportionate number of kilometres driven in urban areas.

Annex - TCO model assumptions

This section details the assumptions made to model the TCO across all vehicle categories. It also provides an anonymised overview of experts interviewed.

Vehicle choice and acquisition

To model the impact of vehicle choice and powertrain across different categories, the models below were selected for the TCO Model. Vehicle choice reflects usual brand and model preferences among taxi and TNC drivers, and are split between Access, Medium, Large and Premium categories to account for various use cases.

	Model	Variant	TCO model category
BEV	Nissan Leaf 40	40kWh	Access
	Nissan Leaf 62	62kWh	Medium
	Tesla Model 3	Standard range + (54kWh)	Large
	Tesla Model S	Long range (100kWh)	Premium
PHEV	Hyundai Ioniq PHEV	Petrol PHEV	Access
	Toyota Prius Plug-in	Petrol PHEV	Medium
	Mercedes C-300e	Petrol PHEV	Large

	Mercedes E-300de	Diesel PHEV	Premium
HEV	Toyota Corolla	Petrol MHEV	Access
	Toyota Prius	Petrol MHEV	Medium
	Mercedes C-200 eq boost	Petrol MHEV	Large
	Mercedes E-200 eq boost	Petrol MHEV	Premium
ICE	Fiat Tipo	Diesel	Access
	Skoda Octavia	Diesel	Medium
	Mercedes C-180d	Diesel	Large
	Mercedes E-200d	Diesel	Premium

Mileage and energy costs

Particularly important for the TCO model are the assumptions related to mileage and energy costs. The model assumes drivers work 264 days a year (22 days per month) on average, and drive 227 km a day, or 60,000 km a year. This appears consistent with official data on the taxi sector (in France^{xxviii} and in the UK^{xxix}).

Vehicles’ energy consumptions were estimated using real-world fuel and electricity consumption database Spiritmonitor.

Energy costs were modelled using IRU^(xxx) and Eurostat data, according to two distinct scenarios: a 2019 oil price scenario based on June 2019 prices, and a low oil price scenario based on April 2020 diesel and petrol prices. Fast charging prices were estimated thanks to expert interview and Chargemap data.

City	Overnight Electricity (€/kWh)	Fast charging (€/kWh)	Diesel (€/L)	Petrol 95 (€/L)	Diesel (€/L) - low oil price	Petrol 95 (€/L) - low oil price
Paris	0.16	0.39	1.50	1.63	1.19	1.26
Lisbon	0.20	0.21	1.45	1.65	1.20	1.30
Madrid	0.20	0.39	1.26	1.34	1.01	1.08
Brussels	0.26	0.50	1.53	1.54	1.23	1.19
Berlin	0.29	0.50	1.29	1.52	1.04	1.13

In the report, the BEV TCOs are split in two different scenarios: BEV 1, with a low fast charge rate at 20% and BEV 2, with a high fast charge rate at 80%.

Others vehicle-related parameters

Following parameters have also been taken into account in the TCO model:

- Maintenance cost, based on New York City taxi fleet data^(xxxi): The baseline ICE maintenance is estimated at €0.02/km. A 30% reduction for HEV, 40% reduction for PHEV, and 50% reduction for BEV are applied based on interviews with drivers.

- Residual value: the model assumes the same following residual value across powertrains: 15% for 5 years ownership period, 25% for four years and 35% for three years.

- Costs of home charger installation are factored in the BEV 1 and BEV 2 scenarios. Based on interviews, it is estimated at €1,500 installation costs included.
- Finance option: the TCO model includes parameters linked to the vehicle acquisition mode (purchase, lease, or loan). The three scenarios impact the TCO only marginally; in the report all vehicles are assumed to be purchased, as this corresponds to the mid-price scenario. Cost-effectiveness of BEVs vs. ICE can be improved by using leasing schemes, but deteriorates with loans
- Insurance costs: 5% of the vehicle upfront cost was used for all vehicle types and sizes. Insurance costs assumed for a 25-year-old driver driving 60,000 km a year, with a basic insurance package.

Expert interviews

For this report, T&E acknowledges the insightful support of 22 different experts and drivers, who accepted to contribute through interviews: five in Belgium, five in France, four in Germany, four in Portugal, one in the Netherlands, and three in the UK. There were two Charging Point Operators, one leasing company, five city representatives, three TNC driver representatives, two DSO, and nine TNC and taxi business representatives.

Endnotes

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- vii) <https://www.transportenvironment.org/what-we-do/electric-cars/how-clean-are-electric-cars>
- viii) Ibid.
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- x) <https://www.transportenvironment.org/press/double-down-ev-sales-tackle-pollution-left-us-more-vulnerable>
- xi) BNEF, 2020, <https://about.bnef.com/blog/electric-vehicle-sales-to-fall-18-in-2020-but-long-term-prospects-remain-undimmed/>
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- xiii) <https://www.transportenvironment.org/publications/electric-surge-carmakers-electric-car-plans-across-europe-2019-2025> ; <https://www.transportenvironment.org/publications/mission-possible-how-carmakers-can-reach-their-2021-co2-targets-and-avoid-fines>
- xiv) <http://temis.documentation.developpement-durable.gouv.fr/docs/Temis/0088/Temis-0088166/23855.pdf>
- xv) <https://www.transportenvironment.org/newsroom/blog/how-keep-cities-pollution-free-after-virus-lockdowns-lift>
- xvi) <https://www.transportenvironment.org/press/paris-mayor-candidates-hidalgo-belliard-and-simonnet-say-uber-must-go-clean>
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^{xxi)} <https://www.ft.com/content/99fc40be-83aa-11ea-b872-8db45d5f6714>

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