CARS 21 Public Hearing – Going-Electric contribution

Four key points for a competitive EU automotive industry and sustainable mobility and growth in 2020 and beyond

Summary

1. **Electric vehicles (EVs) are the future for sustainable mobility.**
   Europe must unambiguously favour EV technology for its automotive industry to remain competitive.

   - **New concerns are ruling the world:** climate change, environmental protection, and energy dependence have become priorities.

   - **Electric Vehicles (EVs) technologies are the most sustainable ones for cars**

     EV technologies include:
     - Battery Electric Vehicles (BEVs): only suitable today for commuting, city driving and other short trips, which represent over 90% of car usage.
     - Extended Range Electric Vehicles (EREVs): also suitable for long trips.
     - Fuel Cell Vehicles (FCVs): may start spreading in the medium future with adequate public support.

     EV technologies are clearly the best one to reduce cars CO2 emissions, urban pollution and noise, primary energy consumption, and oil dependence.
     EVs and power plants have a much higher improvement potential than Internal Combustion Vehicles (ICVs).
     Using biofuels for cars is not efficient: feeding EVs with electricity produced with biomass consumes significantly less biomass than feeding ICVs with biofuels.

   - **EVs price will drop fast once mass produced:**
     Total cost of EV ownership will become competitive in 10 to 15 years.
     While ICVs still have a limited improvement potential, it is at a high cost, and the combined improvement potential of EVs and electricity production is much higher.

   Therefore, EVs are clearly the best technologies for a sustainable mobility. Resources being limited, Europe has to concentrate all its efforts in the best technologies to remain competitive in the future. Technological neutrality is suicidal.

2. **Non-financial incentives to EV buyers are the most effective and inexpensive instrument to stimulate the initial EV spread.**

   - **Public incentives are *initially* needed for EV to spread**
     EVs bring advantages to society, not to their owners.
     It is therefore the duty of governments to stimulate the initial EV spread, until EVs become sufficiently inexpensive to enter consumer habits.

   - **Price is not the main issue**
     Consumers anyway buy cars much more expensive than they *really* need.
     They will only buy EVs if they get a *unique added value* over ICVs.
     Therefore, financial incentives are hardly effective – while more expensive to governments than they can sustainably afford!

   - **Non-financial incentives have proven to be effective – at low cost**
     The main criterion for choosing a conveyance is saving transport time.
     That is why EVs are successful in regions where EV drivers can ***save time***.
     Therefore successful EV introduction requires offering ***time-saving*** to EV drivers: for instance, priority lanes usage, free unlimited public parking, parking spots reserved to EVs, and toll and congestion charge exemption.
     Such incentives are not only very effective, they cost little to governments.

   EVs will only spread fast if EV drivers can benefit of incentives that save them time over ICVs.

3. **In terms of charging infrastructure, the first priority is low-power charging poles in residential districts.**

   - **No-one will buy an EV if he cannot charge it.**
     Over half of EU families do not have a garage and therefore need to charge on public space.

   - **Driving to a fast charging station is not convenient.**
     A 100 km charge takes about 30 minutes, plus the time needed to drive to the charging station. This concept is ill-inspired by the petrol car model: drive to a filling station…

   - **Low-power charging at or near home is convenient and inexpensive.**
     The most convenient way of charging EVs is inspired by the mobile phone model: charge while sleeping. It requires a relatively inexpensive infrastructure: 100 kerbside low-power charging poles (with cut-off during peak electricity) cost no more than one fast charging station that can only charge about 20 EVs per day. Furthermore, night charging uses off-peak electricity, which is good for the grid.

   First priority is to install inexpensive low-power charging poles on the kerbside in residential districts.

4. Light Electric Microcars are ideal for a sustainable urban mobility. But a specific type approval category is needed to enable them.

- **Light Electric Microcars are best for cities and commuters**

  Cars main usage is for commuting and urban traffic: 80% of car mileage is for less that 60km per day, with 1 occupant, mainly in slow traffic.
  Light Electric Microcars are *objectively* ideal for this usage.
  They use less energy, are cleaner and, because of their small size, would significantly reduce traffic and parking congestion.

- **Current type approval categories exclude safe and light Microcars**
  - L7e (quadricycles): mass restriction prohibits adding heavy safety equipment, and power restriction makes them too slow to occasionally drive on fast roads.
  - M1 (cars): excessive weight and size is required in order to comply with safety regulations that are designed for fast road usage; and type approval procedures are too expensive for SMEs.

To enable truly sustainable commuting and urban mobility, a new type approval category should be created, in-between L7e and M1, for light Electric Microcars designed this usage.

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Four key points for a competitive EU automotive industry and sustainable mobility and growth in 2020 and beyond

1. Electric Vehicles are the future. Europe must unambiguously favour this technology for its automotive industry to remain competitive.

Electric Vehicles (EVs) dominated the car market until the twenties then progressively disappeared. And all attempts to revive them in recent decades, such as GM's EV1 in the late nineties, were unsuccessful. Why should they succeed today?

The main reason is that, in the last decade, many things have changed in public perception. Firstly, climate change, which ten years ago was only known to a minority, has become since Al Gore's movie a serious concern for the majority. Secondly, since the yo-yoing price of oil came close to 140$ a barrel in 2008, many people now realise that we are at the end of cheap oil – a peak over 300$ a barrel is not unlikely in the next five years. Thirdly, there is a growing awareness of the hidden costs of urban pollution, notably in terms of health and building renovation.

Therefore, the need to reduce CO2 emissions, oil consumption and urban pollution has climbed high in political agendas. This implies that transport must significantly become greener – especially light vehicles (cars and delivery trucks), which are responsible for a half of the adverse impacts of transport.

And undoubtedly, the cleanest and most sustainable light vehicles are Electric Vehicles (EVs). We define EVs as vehicles whose wheels are powered by electric motors. EVs comprising three technologies:

1. **Battery Electric Vehicles (BEVs)** are EVs powered by batteries charged on the electric network. With the EU average electricity mix, BEVs cause 2.5 times less CO2 emissions than petrol vehicles with same power and weight. They consume no petrol and generate no urban pollution and little noise. Their Well-to-Wheel efficiency is about 50% higher than petrol vehicles: in other words, BEVs charged with electricity produced by petrol-fuelled power plants use 33% less petrol than petrol cars!

   However, BEVs have a limited range. They are well suited for short trips, which represent over 80% of cars mileage, but are not yet practical for long trips. Their usage will therefore mostly be limited to daily commuting and urban trips –the main usage for most cars and light trucks.

2. **Plug-in Hybrid EVs (PHEVs)** are vehicles comprising both a combustion engine, giving them a virtually unlimited range, and a motor powered by batteries that can be charged on an external electric power source as well as by the engine. The simplest and probably most energy-efficient PHEV technology is **Extended-Range Electric Vehicles (EREVs)**, which are BEVs with an on-board generator running on petrol that switches on when the batteries are low.

   Some upcoming PHEV models are capable of driving in full electric mode for several tens of kilometres – enough for most daily trips. Given that such PHEVs will only run on petrol during longer trips (i.e. 20% of car's mileage), they are nearly as clean and sustainable as BEVs.

3. **Fuel Cell Vehicles (FCVs)** are electric vehicles whose electricity is provided by a sort of a battery fuelled with hydrogen (or methane). They are clean, silent, petrol-free and about as energy-efficient as BEVs when hydrogen is produced by steam reforming of natural gas (currently the most common method). Other hydrogen production options exist, such coal gasification with CO2 capture and storage, which is a near-zero-emission process, and electrolysis, which allows storing electricity produced by intermittent renewable source.

   But FCV technology is not yet quite ready for a widespread commercialisation. However, in the medium future, they are likely to become an ideal choice for vehicles covering long distances. And Fuel Cells may also have huge markets in many other fields, such as portable electronics, domestic cogeneration and power plants supplying peak electricity.

What about biofuels and biogas?

Biofuels and biogas are a way of producing a form of solar energy that can be stored. Biofuel resources are limited, especially considering that biocrops can only be produced at the expenses of other land uses: food crops, forest, or wild areas useful for biodiversity preservation.

Using biofuels or biogas for cars is not efficient: feeding EVs with electricity produced with biomass consumes considerably less biomass than feeding Internal Combustion Vehicles (ICVs) with biofuels or biogas. And it is not unlikely that converting biocrops to biomethane and injecting it into the natural gas grid may be the biomass usage that overall saves the most CO_2.

It is therefore preferable to use biomass for electricity or biogas production, and to reserve world's limited biofuel production for transport modes such as planes that cannot be electrified.

Therefore, biofuels are the wrong technology to improve cars sustainability. Favouring biofuels in cars is not only technologically biased, it is a bad choice!

Can't ICVs improve and become better than EVs?

With current technologies, Internal Combustion Vehicles (ICVs) are Well-to-Wheel (WtW) about 33% less energy efficient than EVs, and with the current EU electricity mix, WtW CO_2 emissions of ICVs are 2.5 times higher than of EVs.

Some stakeholders claim that ICVs still have a 20 to 30% efficiency improvement potential. But this will be at a high cost, using complex techniques such as parallel hybridisation that also increase vehicle's weight, thereby increasing energy consumption. Also, petrol production is becoming increasingly energy and CO_2 intensive, which also reduces the WtW efficiency of petrol vehicles.

On the other hand, EVs still have a 10 to 15% efficiency improvement potential. And, as explained below, EV production cost will drop fast with mass production. Moreover, electricity production has the potential of increasing its efficiency by at least 10%, and of diminishing its CO_2 emissions by several tens of %.

Therefore, the gap between the WtW energy efficiency and CO2 emissions of ICVs and EVs will keep growing with time, increasingly making EVs more energy-efficient and CO2-lean than ICVs.

Finally, ICVs will always produce more urban pollution and noise than EVs. And since using biofuels in cars and light trucks is not the right choice (see above), ICVs always be petrol dependent.

For all these reasons, EVs are clearly much more sustainable technologies for car and light truck than ICVs, and will increasingly be so in the future. Europe has to favour EV technologies if it wants to excel in sustainable mobility.

How fast will electric vehicles spread?

Battery Electric Vehicle and Extended-Range Electric Vehicle technologies are simple and reasonably mature. Technically, they could today cover 100% of the light vehicle market, bringing huge benefits to society. So why aren't there more Electric Vehicles (EVs) on the road?

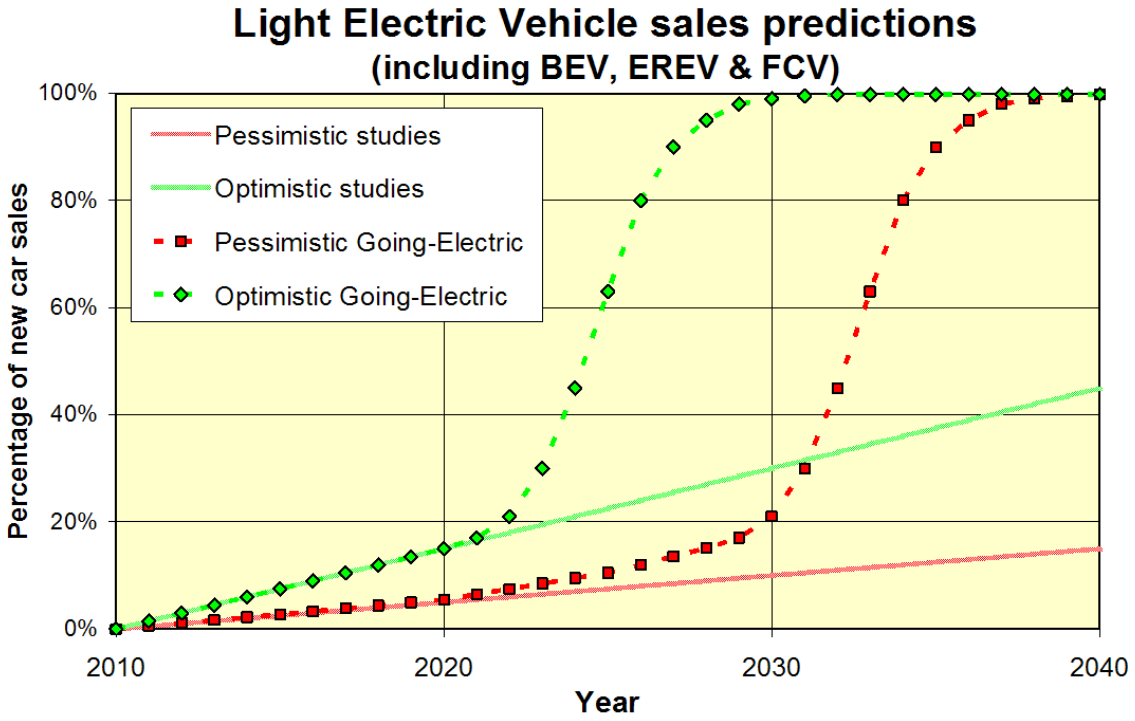
Actually, it's a chicken-and-egg situation. Hardly anyone buys EVs because they are expensive, so they are produced in small quantities. But EVs are expensive because they are produced in small quantities: if they were mass-produced, the total cost of owning an EV would soon be lower than for petrol vehicles. This is obvious when considering the cost reduction potential for EV batteries, which are likely to drop by 50% per kWh every 5 to 6 years, and for EV electronics, which can still undergo a high level of component integration.

EVs bring many benefits to society and little to their owners. It is therefore the duty of public authorities to break this chicken-and-egg situation. Governments must provide incentives to car manufacturers and consumers until mass-production makes EVs competitive.

Financial incentives can help, but they are costly. And experience shows that non-financial incentives, such as access to bus lanes, toll and congestion charge exemption, free unlimited parking on public space, and reserved parking spots, are much more effective incentives – while costing little to governments!

Also, governments should ensure that EV owners can charge at or near home. Those who don't have a garage must have the possibility of charging on public space. Some countries are installing charging stations in city centres, but many forget that they will mostly be needed in residential districts. And a few countries, such as Belgium, have not even considered the question yet!

So the initial pace of EV spread will therefore largely depend on the incentives and charging infrastructure that governments will put in place. Since governmental decisions are versatile and hard to predict, EV sales predictions vary largely from one study to another. Currently, pessimistic studies predict that by 2020, only 5% of all new cars and light trucks will be electric, while optimistic ones predict as much as 15%. And most studies predict a linear increase in the following decades (as per the straight lines on the chart below).



Light Electric Vehicle sales predictions

Going-Electric cannot predict what will happen in 2020, since it depends on government incentives, which are largely unpredictable. However, Going-Electric is convinced that the curve will not be a straight line: sometimes between 2020 and 2030, it will start rapidly rising towards a near 100%, as per Going-Electric's dotted curves on the above chart.

And this for at least three reasons: Firstly, high production volumes and technological improvements will make EV ownership financially competitive against petrol cars. Secondly, the price of oil will probably peak high enough to deter many consumers from buying petrol cars. Thirdly, once EVs are accepted by consumers, cities could well restrain the use of petrol cars and delivery trucks in order to reduce urban pollution and noise and to offset their hidden costs – such as health and building renovation costs.

So it is likely that before 2040, conventional petrol vehicles will virtually have disappeared from the light vehicle market. Europe must become a leader in EVs for its car industry to survive.

Technological neutrality is suicidal.

EVs are clearly the best technologies towards a sustainable mobility, which is a key EU objective. And the sustainability gap between EVs and ICVs will keep increasing, regardless of ICV improvements.

Resources being limited, Europe has to concentrate all its efforts in the best technologies in order to remain competitive in the future. The resources devoted to rescuing soon-to-be obsolete technologies are resources detracted from building a competitive future.

Other countries such as China and the USA are investing significant amounts into their development. They are clearly determined to become EV leaders. If Europe is less proactive, its car industry may well end up like the dinosaurs: extinct.

Therefore, Europe must unambiguously make the technological choices that will put it in the winners' league: EVs. It must abandon its suicidal "technological neutrality" leitmotiv for its car industry to remain competitive.

"If you want to go everywhere, you get nowhere."

2. Non-financial incentives to EV buyers are the most effective and inexpensive instrument to stimulate initial EV spread.

Why should governments help electric vehicles?

Clearly, there is a compelling need to reduce CO_2 emissions, urban pollution and oil consumption. And just as clearly, Electric Vehicles (EVs) are key to a low CO_2, low pollution, oil-free future.

However, this bright future can only happen if public authorities help EV spread during their initial introduction phase. Why? Because EVs bring benefits to society, not to their owner. Furthermore, EVs are manufactured in small series and are therefore significantly more expensive than mass-produced conventional cars. Just think of the first mobile phones: 25 years ago, they weighted nearly two pounds and cost thousands of dollars…

© Wikipedia
Mobile phone from the mid-eighties: 35 cm high and 800g for a cost of 4000$.

Governments are in charge of promoting what is good for society. But they should only promote technologies that have the potential of becoming financially competitive. This is the case for EVs: in ten to fifteen years, large production series, collapsing battery prices, integration of EV electronics and rising price of oil will make EVs sufficiently inexpensive to become the obvious choice for consumers… just as are mobile phones today.

So what should governments do?

Governments should be effective: they should promote EVs with actions that maximise results at a minimal cost. And the most effective way to promote EVs is to create a market: if consumers want to buy EVs, then companies will want to produce and distribute them because it means business. While subsidising companies engaged in EV production or distribution may be instrumental, it is useless if consumers have no good reason to buy EVs.

So the question is how to create a market for EVs. Many governments think that offering financial incentives to EV buyers will do the job, since it reduces the cost difference between EVs and conventional cars. They are wrong: consumers anyway buy cars that are much more expensive than what they really need. So price is not really an issue. And while financial incentives can help, they are very costly – much more than governments can sustainably afford.

The first mobile phones were easy introduced, regardless of their weight and cost, because they brought consumers a sizeable benefit over fixed phones. But EVs don't really bring consumers any major benefit over conventional cars. And they have significant drawbacks: limited range and long charging time. EV usage is therefore limited to relatively short trips, which the main usage for cars; but another car is need for long trips (see annex). So the success of EVs will be very limited if these drawbacks are not compensated by some unique benefits.

Creating unique benefits for EV drivers

So to effectively introduce EVs, governments have to find a way of offering some unique benefits to EV drivers. Which benefits? What is the main criterion for choosing a means of transport? And the answer is… ***time***: people usually chose the conveyance that *saves them time* – as long as the level of comfort and hassle is deemed acceptable.

Therefore the key to successful EV introduction is to offer EV drivers ways of saving time. This can easily be done at very little cost, for instance:

- By allowing EVs on bus lanes.
- By exempting EVs from road tolls and congestion charges.
- By granting EVs free and unlimited parking on public space.
- By providing parking places reserved for EVs.

Such measures have already proven to effectively boost EV sales in at least two places. Firstly in Norway: since it offered all above benefits, it has become the world's most successful EV market. Secondly in London, where slow unattractive EVs such as the G-wiz were successfully introduced seven years ago when EVs were the only vehicles to be exempted from congestion charge. And recent experiences in Denmark reach the same conclusion: the best incentives are those that save EV drivers' time.

Obviously, these measures must be temporary; otherwise EVs will end up filling up bus lanes and public parking, and the congestion charge will become ineffective. But these measures are only needed during initial EV introduction: in 10 to 15 years, when EVs will have entered consumers' habits and mass production will have made them financially competitive, EVs will become an attractive choice even in the absence of incentives. And rather than spending resources in EV promotion, governments will then be able to start collecting juicy EV taxes in order to compensate for the loss of revenue from petrol cars.

3. In terms of charging infrastructure, the first priority is low-power charging poles in residential districts.

Obviously, no one will buy an EV if they cannot charge it. In some regions, many households have a private garage where they can charge. But in other regions, including many large cities, private garages are rare: EVs have to charge on public space.

The common thinking is that the solution is fast charging stations to which EV users drive when their battery is empty. The model for this thinking is based on petrol cars, which occasionally have to drive to petrol stations and refill in a few minutes. But EVs are different – the right model should be based on mobile phones: charge at night while sleeping. For many reasons:

- Even with the fastest charging stations available, a hundred kilometre charge takes about thirty minutes, plus the time wasted driving to the station and waiting for your turn – far too much to be convenient for regular charging.

- With current battery technology, fast charging is not recommended because it reduces batteries life.

- The fastest charging stations can charge about 20 vehicles per day without excessive waiting time. They are about as expensive as a hundred simple, low-power charging poles, with a domestic socket, installed on the kerbside of residential districts, which can conveniently charge 100 EVs per night.

- Charging at night is very simple and convenient: park and plug, just like a mobile phone, whether the battery is empty or not. Much simpler and more convenient than driving to a petrol station…

- At night, electric consumption is low. About a third of the current car fleet could charge at night without reinforcing the grid: night charging is good for utilities…

However, people arrive home around 6pm – just before the peak of electric consumption: if everybody starts charging at that time, power outages are likely. So kerbside charging poles must be equipped with a system starting the charge after the peak. Many options are possible, ranging from simple timers to sophisticated smart grids which communicate with EVs in order to optimise individual charging periods.

A few fast charging stations should however be installed in business districts, around commercial centres and on motorways. The main reason is to combat "range anxiety": otherwise some consumers may fear running out of battery. Also, fast charging stations will be useful for occasional longer trips. But experience shows that they are hardly used: the real need is for low-power charging poles in residential districts.

4. Electric Microcars are ideal for sustainable urban mobility. But a specific type approval category is needed.

Over 80% of daily distances driven by cars are shorter than 100 km, and most of car usage is for commuting and urban trips, usually in slow congested traffic and with only one occupant. For this major usage, light Electric Microcars ideally meet the ***real*** needs of most drivers (see annex).

As demonstrated above, Electric Vehicles (EVs) are petrol free and far more sustainable better for the environment than Internal Combustion Vehicles (ICVs). In addition, light micro-vehicles consume less energy and cause less CO2 emissions and pollution than larger ones; since they occupy less space, they can ***significantly decrease traffic and parking congestion***.

Light Electric Microcars are therefore the key to significantly improve the sustainability of urban mobility without compromising mobility – a major objective of CARS 21. Unfortunately, none of the current type approval categories are adequate for producing the safe and light Microcars needed for this mainstream market:

- M1 cars size and weight have grown beyond urban microcar needs in order to comply with their increasingly stringent occupant safety regulations, which are designed for fast road driving.

- L7e quadricycles are not subjected to satisfactory safety regulations. Worse, they are subjected to mass limitation restricting the addition of safety protection equipments, and to power limitations making them too slow to occasionally drive safely on the short sections of fast roads that comprise many urban and commuting trips.

Therefore a new type approval category should be created in order to enable the production of the safe and light Electric Microcars that are really needed by commuters as well as cities.

The classification criteria, safety requirements and type approval procedures for this new category should logically fall somewhere in-between categories L7e (quadricycles) and M1 (cars). It should be subjected to occupant safety regulations and type approval procedures specifically designed for urban usage: stricter than for L7e vehicles, in order to reduce the risk of road casualties, but logically less stringent than for M1 cars, which are faster and designed for driving on fast roads.

The usage of Electric Microcars would de facto be essentially confined to commuting and urban driving by classification criteria limiting specifications such as dimensions, mass, power, speed and driving range, while still being able to occasionally drive safely on fast roads.

Type approval procedures simpler than for M1 cars would open this sizeable urban microcar market to new entrants, which would be beneficial to the development of innovative European SMEs, in line with the objectives of the Lisbon Strategy.

To enable truly sustainable commuting and urban mobility, a new type approval category should be created, in-between L7e (quadricycles) and M1 (cars), for light Electric Microcars specifically designed for safe commuting and urban usage.

Conclusion

Going-Electric wishes to convey four key messages for a competitive EU automotive industry and sustainable mobility and growth in 2020 and beyond:

1. EVs are the best technologies to fight climate change, urban pollution and oil dependence. Europe must unambiguously favour EV technologies for its car industry to remain competitive. Since EVs hardly bring any benefits to their users, governments must incentivise EV purchase in order to stimulate EV introduction.

2. Financial incentives hardly help and are costly. And experience shows that non-financial incentives, such as access to bus lanes, congestion charge exemption, and free unlimited parking on public space, are much more effective – and far less expensive to governments.

3. EVs must be able to charge. What's most convenient for users and best for the grid is night charging at or near home. The first priority is to install simple, inexpensive low-power charging poles on the kerbside of residential districts for families without a private garage.

4. A new type approval category should be created, in-between L7e (quadricycles) and M1 (cars), for light Electric Microcars specifically designed for truly sustainable and safe commuting and urban traffic.

Appendix: What will the car market look like in the future?

There are two main usages for cars:

1. **Long distances**, such as week-end and holiday journeys with the family, as well as professional use, such as technicians and salesmen carrying equipment or samples. For such usage, a large powerful car better in terms of comfort and occupant safety, and the Extended Range Vehicle (EREV) technology is currently the most sustainable one.

2. **Short distances**, such as daily commuting and urban use, often in congested traffic with only one occupant. This is clearly the dominant usage for cars: it is often said that 80% of car mileage is daily distances shorter than 60 km.

   For this usage, small and light Battery Electric Vehicles (BEVs) are objectively the best choice:

   - Small vehicles are easier to park and to handle through congested traffic.
   - BEVs are silent and non-polluting - a bonanza for urban environments!
   - Small light BEVs consume little energy and cause little CO2 emissions.
   - The comfort of a large car is not really an advantage for short distances.
   - Since such short distances are usually driven at slow speeds, the occupant safety of a large car is unnecessary.

Assuming that consumers are rational and that future tax and incentives schemes will target the common good, it is likely that the car market will increasingly be divided into two distinct segments: large EREVs for long distances and mixed usage, and (ultra-)small BEVs for daily commuting and urban use.

A few manufacturers are already betting on it, proposing Electric Microcars shorter than 3 m, which occupy half of the space of a large car: for instance the two-seat Smart EV, and the three-seat MIA. Some other producers propose ultra-narrow electric cars that are no bigger than a large motorcycle:

Lumeneo - Smera
France

Tilting M1 car (small series)
Produced since 2011

98cm wide, 250cm long, 500kg
110 km/h, 0-100 km/h in 9 s
Driving range 100 km

www.lumeneo.fr

Renault - Twizy
France

L7e quadricycle
Announced for 2011

119cm wide, 230cm long, 420kg
75 km/h
Driving range 100 km

www.renault.com

SynergEthic - Tilter
France

Tilting L5e tricycle
Announced for 2012

90cm wide, 253cm long, 340kg
110 km/h, 0-100km/h in 13 s
Driving range 120 km

www.tilter.fr

In addition to being cleaner and more sustainable than large cars, such ultra-narrow cars are a very effective solution against urban congestion, since they occupy about a quarter of the space of large cars in slow traffic and parking. Such cars are therefore ideal for cities. Public authorities should be visionary enough to provide the non-financial incentives needed for their rapid spread.