



Urban Electric Mobility in a 1.5°C Scenario



This paper was prepared by:

SOLUTIONS project

This project was funded by the Seventh Framework Programme (FP7) of the European Commission

www.uemi.net

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The project has received funding from the European Union's Seventh Framework Programme and Horizon 2020 under the grant agreements no 604714 (SOLUTIONS) and no 723970 (FUTURE RADAR)



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The Urban Electric Mobility Initiative (UEMI)

The Urban Electric Mobility Initiative (UEMI) (www.uemi.net) launched by UN-Habitat at UN Climate Summit held in September 2014 seeks to increase the uptake of Electric Vehicles in the overall context of better urban planning and a shift to cleaner sources of energy, where accessibility is at the core of urban mobility and access for all to services, amenities and goods is considered as the overall goal of all transportation. UEMI responds to the high, and increasing, GHG emissions from urban transport, and the significant potential of electric vehicles to address this. Specifically, the initiative aims to phase out the use of conventionally fuelled vehicles and increase the share of electric vehicles in the total volume of individual motorized transport in cities to at least 30% by 2030. UN-Habitat has advocated uptake of Electric Mobility starting from an Expert Group Meeting held in Barcelona in 2014 which resulted in the issue of a Communiqué by over 70 experts from various countries, the UN Climate Summit, WUF, COP and other international fora.

Signifying widespread support, UN-Habitat's Governing Council in 2015 adopted a resolution : "[Governing Council].....encourages Member States to support initiatives aimed at improving access to sustainable energy and mainstreaming energy efficiency and sustainable energy systems to support the UEMI, while promoting hybrid and electric mobility as a priority in conjunction with urban policies in support of compact city planning, energy and resource efficiency, making the transition to sustainable sources of energy and better public transport systems and facilities integrated with safe and attractive non-motorized transport options."

Uptake of E-mobility will require investments in infrastructure, policy and regulatory actions, investments by industry. Capacity building and demonstration projects also play an important role as presented in the figure above. The Urban Electric Mobility Initiative supports cities in developing implementation concepts, developing policy proposals, identify financing solutions and building capacities as part of a number of projects such as SOLUTIONS and FUTURE RADAR (<http://www.uemi.net>) and EMPOWER (<http://empowerproject.eu>).

In an effort to go beyond the transport sector and to create synergies between urban energy, mobility and resource sectors, UN-Habitat with its partners, UN

Environment and the Wuppertal Institute recently launched the URBAN PATHWAYS project that will support cities in developing Low Carbon Plans for Urban Basic Services in the context of the New Urban Agenda. Supported by the Federal Ministry for Nature Conservation, Building and Nuclear Safety (BMUB), of Germany, this project also seeks to contribute to the uptake of Electric Mobility in the context of better urban planning and a transition to clean sources of energy. UN-Habitat is reaching out to cities and other partners to collaborate on this project (<http://www.urban-pathways.org>).

Electric mobility as part of a wider sustainable transport concept

Transport plays a key role in delivering on the Paris Agreement, the Sustainable Development Goals and the New Urban Agenda. While providing essential services to society and economy, transport is also an important part of the economy and it is at the core of a number of major sustainability challenges, in particular climate change, air quality, safety, energy security and efficiency in the use of resources. Electric mobility solutions are a key element in this, but need to be integrated in a wider concept for sustainable mobility to deliver on climate change mitigation targets and on opportunities for contributions to wider sustainable development objectives.

Electric mobility can play a significant role in the decarbonisation of the land-transport sector. Many mobility solutions are readily available, several of which are already cost-effective and can deliver wider socio-economic benefits, which makes the prioritisation of these solutions pivotal for policy decisions in this area. From a societal perspective, the electrification of public and shared vehicles fleets is the more cost-effective option, since these vehicles tend to drive longer distances. This suggests that these sectors should be priorities for policy intervention. While supporting the uptake of all types of electric vehicles is vital for the transition to low-carbon transport technology is vital, efforts to do so should not be carried out at the expense of investments in public transport, walking and cycling infrastructure investments.

Vehicle technologies and fuels have a key role to play in decarbonizing the transportation sector and may provide the biggest potential climate change mitigation (Improve). However, these strategies alone do not fully reflect a broader sustainable transporta-

tion perspective. A multimodal and integrated policy approach can minimise rebound effects, overcome split-incentives, and achieve a higher level of socio-economic co-benefits. In particular, reducing the need for travel through compact city design and shifting to low-carbon modes (Avoid, Shift) can create mitigate GHG emissions and contribute to sustainable development.

Transport is a key enabler of economic activity and social connectivity. However, the transport sector, in 2013, was responsible for approximately 28% of total energy-related CO2 emissions. Greenhouse Gas Emissions from the sector has more than doubled since 1970 - increasing at a faster rate than any other energy end-use sector to reach 7.0 Gt CO2eq in 2010. In a business as usual scenario, transport emissions could increase at a faster rate than emissions from other energy end-use sectors and reach about 12 Gt CO2 a year by 2050 (IPCC 2014). Increasing emissions from the transport sector can endanger the goal of limiting the increase in global temperatures to two degrees Celsius above pre-industrial levels. In addition, transport is a major contributor to outdoor air pollution.

The potential role of modal shift in helping to achieve international E-mobility targets

The Paris Declaration on Electro-Mobility launched at the climate summit COP 2015 targets a 20% stock share of passenger vehicles (cars, SUVs and other passenger light-duty vehicles, buses and motorized 2 wheelers) to be powered by plug-in electricity by 2030. As shown in Figure 1, the IEA projects about 2.5 billion such vehicles on the world’s roads in 2030 (1.6 billion PLDVs, 0.8 billion 2/3 wheelers, and a few million buses). With the targeted levels of electric vehicles much higher (as a percentage) for 2/3 wheelers (given that there are already 200 million in China), the total plug-in 2/3 wheeler stocks are about 350 million (42%) and total PLDV stocks are about 150 million (9%).

In particular, reaching the stock targets for passenger light-duty vehicles may be challenging. The target of 150 million plug-in PLDVs needed by 2030 (to reach 9% of total PLDV stock) is more than two orders of magnitude more than today’s stock levels of around 1 million. To achieve this will require a rapid growth in sales from the current levels (of around 0.4 million per year) to perhaps 30 million per year in 2030.

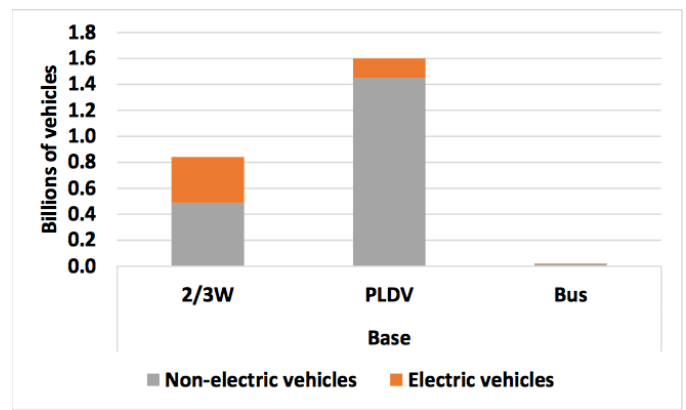


Figure 1: IEA project 2030 stock of vehicles and the target percentage of e-vehicles by vehicle type

One way to lower these requirements, while preserving the percentage stock targets, is consider an alternative future, one with urban travel re-oriented toward mass transit and active transport (walking and cycling) modes, with less car travel. In the recent “High Shift” scenario work of ITDP and UC Davis, car travel in urban areas around the world is cut by about 20% in 2030 compared to a BAU scenario. Motorized 2-wheeler travel (i.e. via ICE motorcycles and scooters) is also cut somewhat.

While re-orienting future urban development and transport growth in this manner will be extremely challenging to achieve (given the natural tendencies of countries to increase the use of cars over time at the expense of other modes), the changes in numbers of electric vehicles needed (with no changes in their percentage targets) can be easily calculated. As shown in Figure 2 and Figure 3, in the High Shift scenario the total stock of personal vehicles, and required stock of plug-in electric vehicles, drops significantly. Figure 3 shows the change just in electric vehicles that preserves the 20% stock target: 2&3 wheeler plug-in requirements drop from 350 to 300 million; PLDV plug-in requirements drop from 150 million to 100 million. Bus numbers rise somewhat, since there are more buses in the High Shift scenario.

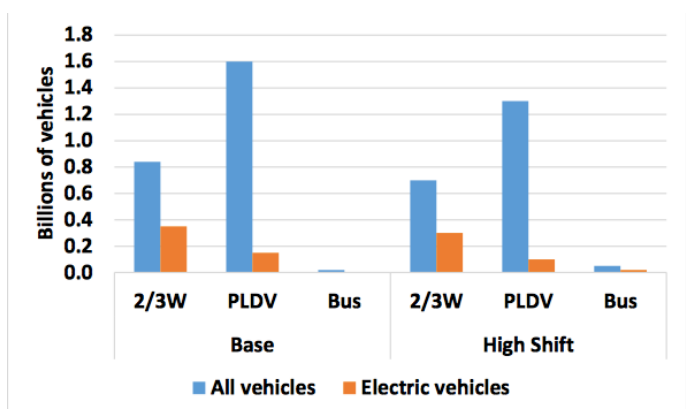


Figure 2: Base and High Shift scenario comparison of all vehicle and e-vehicle stocks in 2030

Thus the High Shift scenario would provide a similar level of mobility and allow a relaxation of plug-in vehicle numbers while still hitting the percentage targets. And since the modal shift itself cuts CO2 emissions significantly, it results in an overall greater level of CO2 reduction than achieved by the electrification in the Base scenario.

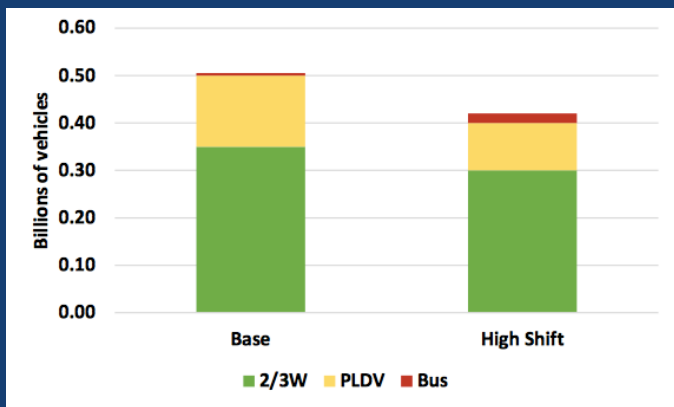


Figure 3: E-vehicle stocks in the two scenarios for 2030

Prioritising electrification options for land-transport

Electric mobility can play a significant role in the decarbonisation of the land-transport sector. Many e-mobility solutions are readily available, several of which are already cost-effective and can deliver wider socio-economic benefits, which makes the prioritisation of these solutions pivotal for policy decisions in this area. From a societal perspective, the electrification of public and shared vehicles fleets is the more cost-effective option, since these vehicles tend to drive longer distances. This suggests that these sectors should be priorities for policy intervention.

The figures below (Figure 1 and 2) shows estimated cost per passenger kilometre for a range of modes and technologies (electric) in OECD Europe and India. These indicate that vehicle “life cycle” costs for operating EVs are close to (or lower than in some cases) ICE vehicles. The importance of different factors (e.g. drivers and fuel cost) differs by region, for example the low labour cost of the bus drivers, along with higher average load factors in India and other developing economies makes public transport modes even more cost effective than in industrialised (OECD) countries. But in both cases EV costs are close to competitive on a life-cycle basis; this will only improve over time as battery costs continue to drop.

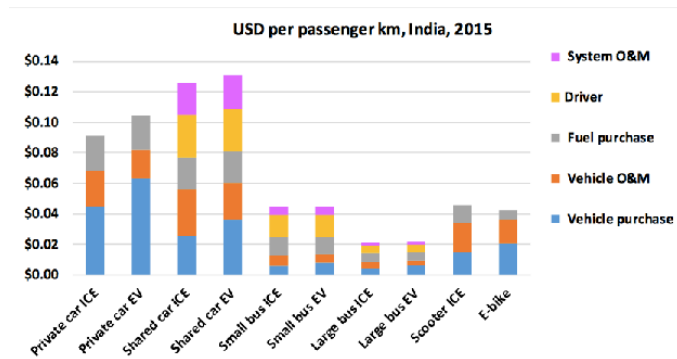
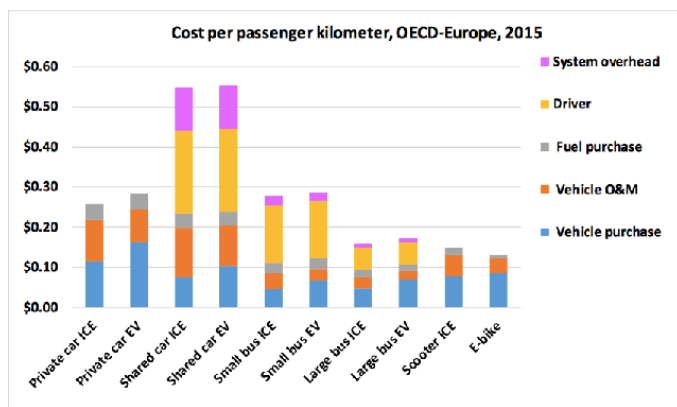


Figure 1 Costs per passenger kilometer in Europe
Figure 2 Costs per passenger kilometer in Asia

Table 1 and 2 notes: Derived from UC Davis/ITDP 2017, with additional calculations made for this paper. These figures do not appear in the original study. Costs are based on 10 years of vehicle operation with a societal discount rate.

The cost per passenger kilometre for different vehicles types also changes over time as e-mobility technologies become more cost competitive. The results for 2030 of this analysis show that by 2030 the life cycle costs of electric cars are lower than those of an internal combustion engine powered private car. By then the shared modes are even more cost effective, in particular if automation for public transport is becoming a viable option.

References

UC Davis/ITDP (2017) Three Revolutions in Urban Transportation, <https://steps.ucdavis.edu/three-revolutions-landing-page/>

Paris Declaration on Electro-Mobility and Climate Change and Call to Action (2015) Electrifying Sustainable Transport, <http://newsroom.unfccc.int/media/521376/paris-electro-mobility-declaration.pdf>

Sims, R, R Schaeffer, F Creutzig, XC Nunez, M D'Agosto, D Dimitriu, MJF Meza, L Fulton, S Kobayashi, and O Lah (2014) "Transport." Mitigation. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

IEA. 2015. Energy Technology Perspectives, Mobilising Innovation to Accelerate Climate Action, <http://www.iea.org/etp/etp2015/>



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