European Commission

HORIZON SCANNING ALERT

Urban e-mobility and impacts on energy consumption

Electric vehicles coming of age

Electric car sales in 2020 climbed to over 3 million globally, achieving a market share of over 4%[1], surpassing 2.1 million of the record year 2019, in which also ca. 25% of all two-wheelers were electric (ca. 95% in China), while electric micro-mobility is becoming increasingly popular in many large cities[2]. Furthermore, light electric vehicles are increasingly seen as a sustainable alternative that could already be used for a significant part of the trips and the distance travelled by private, often unsustainable, means of transport[3].

Electric vehicles are gaining momentum as a key enabler to reach global long-term climate goals[4]. The electrification of transport can help achieve less oil dependency, lower greenhouse gas emissions and cleaner decarbonised energy for electric vehicles[5]. New players are emerging with innovative and disruptive technologies and services, as in the case of shared, electrified or autonomous mobility, blurring traditional demarcations between public transport and private mobility[6]. Shared micromobility may play a key role in the post-pandemic urban transport mix to reduce private car travel and ease public transport capacity challenges.

EU sustainable mobility policy

The European Green Deal highlights the need to reduce emissions by 90% across all modes by 2050 to achieve climate neutrality. Renewable energy in transport has to increase from 6% in 2015 to 24%. Further development and deployment of electric vehicles, advanced biofuels and other renewable and low carbon fuels are part of a holistic and integrated approach to achieve this aim. Conventional cars will need to be gradually replaced by zero-emission vehicles. Sustainable collective transport services have to be further developed[7] to meet targets for emissions [8] [9] and renewable energy in the European Union.

The 2013 Urban Mobility Package and the interlinked Communication "Together towards competitive and resource efficient urban mobility" focused on targeted financial support for research and innovation actions and Member State cooperation[10]. A revision of the Urban Mobility Package is expected in 2021. The 2020 Sustainable and Smart Mobility Strategy action plan recognises the issuing of guidelines to support the safe use of micromobility devices as a priority for 2021[11].

Micromobility and urban e-mobility

Micromobility is a growing transport trend. It is based on various types of microvehicles that include human-powered and motorised conventional light vehicles and new emerging types of vehicles. New business models and a turn towards mobility as a service and new sharing mobility schemes have been providing a new push to micromobility and new urban mobility paradigms[12]. The potential drawback of limited range could be addressed within an integrated public system focusing on first-mile/last-mile mobility[13].

Cities are increasingly announcing plans to shift mobility from private cars towards sustainable, environmentally friendly and user-oriented solutions, and establishing car-restricted or car-free areas[14]. Micromobility is an efficient urban mobility alternative, which does entail regulatory challenges. Further uptake of individual motorised traffic, such as e-scooters, can pave the way for new and innovative ways to regulate urban mobility, including geofencing, zoning and data sharing[15]. As the spectrum of mobility choices grows, the consumer

[1] https://www.iea.org/commentaries/how-global-electric-car-sales-defied-covid-19-in-2020
[2] https://www.iea.org/reports/electric-vehicles
[3] https://doi.org/10.3390/su12198098
[4] https://doi.org/10.3390/en13071828
[5] https://doi.org/10.2760/00563
[6] SWD(2017) 223 Final
[7] COM(2020) 562 Final
[8] COM(2011) 144 Final
[9] https://doi.org/10.3390/su12093762
[10] COM(2013) 913 Final
[11] COM(2020) 78 Final
[12] https://doi.org/10.3390/su12229505
[13] https://doi.org/10.1186/s13705-018-0149-0
[14] https://doi.org/10.1016/j.trd.2018.07.004
[15] https://doi.org/10.1108/978-1-83982-650-420201010

dimension gains importance, including the willingness to pay towards greener transport [16]. Sharing schemes have potentially large resource impacts, especially if they replace trips previously done using public transport or walking. The COVID-19 pandemic also affects current and future shares of private versus public transport, e-bikes, scooters, cars etc.

The measures taken to stimulate car-free cities (e.g., number/length of roads dedicated to alternative transport modes) can support further micromobility and urban e-mobility in line with evolving transport electrification. Appropriate policies positively affecting consumer behaviour on low-emission mobility can be crucial towards a near zero emission mobility transition[17].

Power grid implications

The transition to e-mobility can have a long-term impact on energy consumption of the transport sector. The ongoing energy transition has started revealing the limitations of the power grid in its traditional form, since requirements are evolving mostly due to increasing intermittent renewable energy sources and changed consumption patterns. Changes of the electricity infrastructure are required to ensure future stability of the power grid[18]. The boom in alternative transport modes has implications on energy and on resource consumption and the production value chain has to adapt to the new technological reality[19].

TRIMIS Horizon Scanning Session outcome

The Strategic Transport Research and Innovation Agenda (STRIA) outlines future transport research and innovation priorities to decarbonise the European transport sector. The Transport Research and Innovation Monitoring and Information System (TRIMIS)[20] supports the implementation and monitoring of STRIA and its seven roadmaps[21].

The 1st TRIMIS Horizon Scanning Session gathered insights from transport experts with different backgrounds to make sense of transport-related news items. This process identified emerging issues and selected two particularly impactful developments[22] [23].

Short term: Electrification and possible grid impacts

Extremely fast electric-vehicle uptake will affect electric power generation and the grid. Potential consequences include:

—Temporal scarcity and/or price increases of electric power;

—Air quality and greenhouse gas emission issues if additional demand covered by fossil fuel based power generation;

—Need for (smart) grid reinforcements and load management;

—Potential higher taxation of electricity, higher costs and increased inequalities;

—More important role for the electric power sector.

Long term: Radical solutions to replace cars in urban environments

Minimising or replacing car use in urban areas can play a key role towards transport decarbonisation. It will require paradigm shifts such as increased use of public transport and green modes, including traffic calming measures, more pedestrian zones and better bicycle infrastructure in city centres. New business models can also have a supporting role in minimising the need for movement or private car use (e.g. increased telework or car sharing for trips outside centres). Measures focusing on car ownership and use can also have a significant role (e.g. increased car use taxation, road pricing, lower speed limits).

More far-reaching measures could involve banning cars in cities or channelling cars towards underground/tunnel mobility. The resulting increase in public and mass transport demand should be accompanied by appropriate measures to ensure high levels of service and user satisfaction. Potential consequences include:

—Change in city centre retail business;

—Higher values of downtown houses and parking spaces;

—Increased need for car users to plan ahead;

—Increased use of public transport;

—Less air and noise pollution, less traffic;

—More green and public spaces.

Way forward

Smart mobility systems and services and transport electrification have the potential to contribute to transport decarbonisation. Policy and innovation efforts have to focus on integrated transport strategies as part of wider smart and sustainable city strategies. They should take into consideration the forthcoming power needs linked to the rise of a new mobility paradigm. The new mobility paradigm is based on new types of vehicles, energy sources, practices and business models that have the potential to improve urban resource efficiency within an integrated transport system. Meanwhile, the decarbonisation of energy supply has to gain momentum through the promotion of renewables-based electricity production, supported by advanced electricity storage systems.

In this framework, all implications of the emerging trends have to be considered in the governance and related research and innovation in the field, including emissions and air quality, energy consumption and renewables, accessibility, safety, efficiency and overall quality of life. Therefore, targeted support and funding of research and innovation covering both technical and socioeconomic aspects may better support the further uptake of new technologies. Furthermore, the consequences of large-scale electrification in the urban and smart city-smart mobility context should be assessed in both the transport and energy research domains, taking into consideration the whole life environmental footprint and circular economy aspects of emerging technologies. A thorough cradle-to-cradle analysis covering the emerging solutions is also required, including reuse and recycling options for the materials.

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[16] https://doi.org/10.1016/j.erss.2020.101457
[17] https://doi.org/10.2760/8053
[18] https://doi.org/10.1186/s42162-019-0072-4
[19] https://doi.org/10.1080/09535314.2019.1619522
[20] https://trimis.ec.europa.eu
[21] https://doi.org/10.2760/203362
[22] https://doi.org/10.2760/47162
[23] The TRIMIS team of the *Sustainable Transport Unit* organised this Horizon Scanning exercise, supported by the *Knowledge for Energy Union Unit* of the *Energy, Transport and Climate Directorate*, and the *EU Policy Lab* of the Joint Research Centre.