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【欧州】【Common, 自動車】

Common - Outlook on recent trends and developments in logistics: A zero-emissions last-mile delivery services vehicle solution: The URBANIZED project for greening urban freight transport

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【概要：Summary】

In the EU, over 70% of citizens live in urban areas including cities, towns, and suburbs. At the same time, 23% of the EU's total transport sector's GHG emissions come from urban areas. Therefore, cities are still facing major challenges to improve their mobility and transport system and make it more sustainable.

To tackle CO_2 emissions, air pollution and congestion in urban areas, many EU cities have introduced Urban Vehicle Access Regulations (UVAR), which excludes certain vehicles with Internal Combustion Engines (ICE) from the circulation in city centres. This situation increases the need for a swift transition towards alternatively fuelled vehicles. This transition has also an impact on the urban freight transport.

Since cities see a further increase in e-commerce activities and home deliveries since the COVID-19 pandemic, the demand for urban freight transport is increasing and this increase in last-mile deliveries is expected to persist also in future. At the same time, the cities are also planning to discontinue the delivery of goods by trucks equipped with Internal Combustion Engines (ICE), and to completely ban them from urban areas by 2030 to improve air quality in urban areas.

In this context, electrified vehicles in urban area logistics are emerging as an effective answer to the new requirements of an on-demand economy and the need to achieve a more sustainable urban environment. This is expected to lead to an accelerated introduction and utilisation of electric light commercial vehicles (e-LCV). In fact, e-LCVs with high flexibility for meeting the changing requirements of commercial use in the last-/first-mile delivery in urban areas need to be developed. In this context, the URBANIZED project is presented as an example for the development of an electric vehicle in commercial use that has a high-performance e-powertrain, and a modular/interchangeable cargo body, which can be adapted to different needs in urban freight delivery services and missions. The URBANIZED project's aim will be to introduce a new electric light commercial vehicle with a purpose-designed modular cargo space to optimally perform last-mile delivery operations in urban freight transport (UFT).

【記事：Article】

1. The need to make urban freight transport sustainable

Over 70% of EU citizens live in urban areas including cities, towns, and suburbs and 23% of the EU's transport sector's total GHG emissions are emitted in urban areas (European Commission n.d.a, 2021a). At the same time, cities are still facing major challenges to further improve their mobility and transport system, they still must tackle the negative consequences of transport for society, including not only GHG emissions, but also air and noise pollution as well as congestion and road fatalities (COM(2021) 811 final). Several cities have introduced Urban Vehicle Access Regulations UVAR to reduce carbon emissions and air pollution coming from the use of Internal Combustion Engines (ICE) vehicles in urban areas, which could help to accelerate the transition towards alternatively fuelled vehicles (Urbanized 2022). The transition to safe, accessible, inclusive, smart, resilient and zero-emission urban mobility requires a clear focus on active, collective, and shared mobility with low- and zero-emission solutions (COM(2021) 811 final).

Furthermore, to reduce GHG emissions by at least 55% by 2030 and by 90% by 2050, and to reduce air pollution to improve air quality in the urban areas, the urban transport systems need to become emission-free. In many urban areas, there exist plans to completely ban ICE vehicles by 2030, which, in urban freight transport, should lead to an acceleration of the adaption of e-LCVs (Urbanized 2022).

Regarding urban freight transport, it is essential to the functioning of urban economies, which have seen a further increase in e-commerce activity and home deliveries since the COVID-19 pandemic. Consumer e-commerce deliveries grew by 25% in 2020 due to the pandemic, and the increase in last-mile deliveries is likely to continue (WEF 2021, COM(2021) 811 final).

However, currently, urban areas are still facing air quality degradation also caused by delivery trucks equipped with Internal Combustion Engines (ICE), among others (European Commission n.d.c). Consequently, an increasing number of cities across Europe have decided or are in the process of deciding to restrict access to urban areas of diesel fuelled freight transport vehicles. Therefore, also in freight transport in urban areas, alternative fuels need to be found for the last-mile delivery. Alternative light delivery truck technologies such as battery technology or other low and zero emission technologies are under consideration, to replace diesel LDVs in urban areas.

The EU Urban Mobility Framework (COM (2021) 811 final) presents technologically and innovation-oriented solutions including more sustainable urban freight transport and logistics, including more effective zero-emission city freight logistics and last-mile deliveries for reaching the goal of zero-emission urban logistics in urban nodes (above 100,000 inhabitants) by 2030 (COM(2021) 811 final). The EU Urban Mobility Framework intends to also increase zero-emission urban logistics, last mile deliveries and urban fleets (taxis and ride-hailing services) (European Commission n.d.b).

Regarding urban freight transportation, sustainable solutions using new distribution models, dynamic routing, and a better multimodal connected use of urban rail and inland waterways need to be accelerated (COM(2021) 811 final). The electrification of urban freight transport appears to be one of the key initiatives to help reach the EU's general objectives of a 55% reduction of CO_2 emissions by 2030 and climate neutrality by 2050, as it could reduce total road transport carbon emissions by at least 3% (URBANIZED 2022).

2. Plans for Sustainable Urban Logistics

In urban freight transport, innovative sustainable solutions are needed, starting with policy initiatives and the deployment, uptake and upscaling of new zero-emission vehicles, new distribution models, dynamic routing, and improved multimodal connections with urban rail and inland waterways (European Commission n.d.c). Sustainable Urban Mobility Planning (SUMP) is a strategic and integrated approach for dealing with the mobility needs of people and businesses in cities and their surroundings to improve accessibility and quality of life through achieving sustainable mobility (European Commission n.d.b, 2019). Following the official guidelines of SUMP developed in 2013, the existing SUMP concept was updated in 2023 with integrating new EU strategies and policy priorities, additional information based on practical experience, new trends and new good practices (European Commission 2019, (European Commission n.d.b).

Since the Urban Freight Transport is a main contributor to congestion and pollution of the cities city centres, but is also a fast-developing industry, it had to be addressed in this update for finding solutions for an effective and efficient distribution of goods in cities. The development of Sustainable Urban Logistic Plans (SULPs), in line with the cities SUMPs, has been the approach followed by some of the cities (European Commission 2019). City authorities are encouraged to integrate the freight transport dimension within their sustainable urban mobility plans (SUMPs) through dedicated sustainable urban logistics plans (SULPs). The integration of SULPs within the SUMP framework, and voluntary data sharing between all types of stakeholder should lead to more effective zero-emission city freight logistics and last-mile deliveries (European Commission 2021b). The application of clear urban freight planning and frameworks at the local, national, and European level would allow logistics stakeholders to exploit the necessary economies of scale to reduce risk factors from investments and thereby to accelerate the transition towards sustainable urban logistics and last-mile delivery (European Commission n.d.c).

Considering an efficient interconnection between long distance and “first and last mile” freight transport is fundamental and needs to be taken into consideration for city planning purposes. This also translates into measures included in the revision of the TEN-T Regulation COM/2021/812 final, which would also set specific requirements to manage traffic of freight to and from cities, to better integrate urban nodes in the TEN-T (COM/2021/812 final). It provides for a reinforced approach to a larger number of urban nodes, requiring the development of multimodal freight terminals (European Parliament 2024a). The Parliament and Council negotiators agreed on updated guidelines for the trans-European transport network on 18 December 2023 (European Parliament 2024a).

3. Zero-emission urban freight logistic and electrified last mile delivery

While recently the EU introduced the legislation in favour of a ban of new passenger cars and vans with ICE by 2035, except for ICE using e-fuels, the transition towards zero-emission urban transportation is expected to become visible also in the freight transport sector, most notably in urban areas. Electrifying urban freight transport is expected to have the potential of improving the environmental situation in cities and urban areas while bringing other benefits such as quieter cities, better working conditions and lower carbon emission levels (Urbanized 2022). The electrification of urban freight transport is also seen as an important initiative to help reach the EU’s mid- and long term GHG emission reduction targets, as it could reduce total road

transport's GHG emissions by at least 3% (Urbanized 2022).

The introduction of new emission standards and the new urban vehicle access regulations gradually set stricter limits to the emissions of vehicles in cities, which leads to the development of smaller and cleaner light commercial vehicles, suitable for operating in an urban environment (Urbanized 2022). This also leads to new opportunities for specialised vehicle designs, more specific to urban users and last mile delivery (Urbanized 2022). New vehicle architectures should lead to flexibility and modularity to ensure compatibility with urban freight transport needs, most likely with different implementation levels of infrastructure and smart technologies (Cordis 2022a). Additionally, these new vehicles for urban use do not need to be designed for high-speed operation and long range and can be easily charged sufficiently fast and comfortably to meet the daily needs of urban and suburban mobility usage scenarios (Cordis 2022a). Typically, electric-Light commercial vehicles (e-LCVs) with their efficient, clean, and modulable solutions appear to be one of the most promising innovations to address the needs in a more sustainable urban freight transport. However, barriers of various types still exist, thus creating necessary conditions for a full take-over of e-LCVs in the urban logistics market remains difficult, with technology costs and acquisition costs remaining substantially higher than those of LCVs with ICE (Urbanized 2022).

Therefore, the Horizon European Research and Innovation (R&I) Framework Programme supports demonstrations and pilot actions on sustainable last-mile solutions of urban logistics towards the deployment of zero emission freight transport solutions for the urban environment (European Commission n.d.c). The aim is to develop rightsized vehicles for commercial uses such as last-/first-mile delivery, as well as construction and maintenance support (masons, plumbers, HVAC technicians etc.), that are suitable specifically for urban scenarios (Cordis 2022a). Affordability will be aimed at as an acceptable acquisition price and lower operational expenditure are essential, besides the need of specific tailoring to particular urban usage needs (Cordis 2022a). The targeted electric vehicles will cover small and light vehicles following the design principle of right-sizing vehicles for their mission. There is also a new concept of trailers in preparation, which is a fully equipped electric trailer, supporting the transition towards sustainable urban freight transport (Cordis 2022b). The 10 projects funded under the Horizon European Research and Innovation (R&I) Framework Programme such as the eTrailer project that can be attached to any bicycle or e-bike are all concepts that are aiming at reducing the last mile deliveries' carbon footprint and they are set to redefine the last mile deliveries in urban areas (Cordis 2022b, Cordis 2024).

4. The URBANIZED project

Considering the need to improve air quality and reduce CO_2 emissions in cities and urban areas, electrified logistics has emerged as an effective answer to the requirements of a transition to low and zero emission transport in the urban environment (Cordis 2023b). The aim is to develop rightsized vehicles for commercial uses for the last-/first-mile delivery, construction, and maintenance support for urban areas (Cordis 2022a).

In this context, the project "URBANIZED" introduced innovations to improve urban logistics, focusing on the powertrain, the cargo body, as well as fleet management solutions to develop and demonstrate the next generation of modular vehicle architectures for urban-sized commercial e-vehicles (Cordis 2023a, 2023b).

The URBANIZED Grant agreement ID: 101006943 signature took place on 1 December 2020 and the project started on 1 January 2021 (Cordis 2024). The project end date is set for 30 June 2024. The total cost is set at € 6,398,681.08 with an EU contribution of € 5,119,239.60 (Cordis 2024). The EU-funded URBANIZED project is working to introduce sustainable last-mile delivery solutions by solving the trade-offs between the "one size fits all" and "design for purpose" approaches to sustainable last-mile delivery in the design of modular all-electric LCVs (URBANIZED n.d., Cordis 2023b). The overall goal of the URBANIZED project is to design a small, modular electric vehicle for urban freight transport (UFT) (McHugh 2024). It aims to integrate flexibility and adaptability through modularity in the design of e-LCVs, making vehicles more adaptable to a larger range of on-demand UFT (Urban Freight Transport) services, while reducing the number of necessary vehicles and substantially improving last-mile delivery operations' efficiency.

The URBANIZED consortium of 9 partners from 6 EU countries, involving all relevant actors from the value chain, from academic, to industrial (TIER1, OEMs) and logistics operators aims at involving 3 satellite cities (Groningen, Madrid, and Bergen), which are committed to introduce CO_2-emissions free logistics in their city centres by 2030 (Cordis 2024).

URBANIZED follows a holistic design approach working at 3 levels (systems, vehicle, fleet) during the entire project. This starts with the definition of specific mission profiles within 2 main pre-selected use cases (last-mile delivery of retail, e-commerce, courier, and post; HoReCa and other urban on-demand services), during the optimisation loops of the design process, and until project demonstrations, to be performed both physical and in virtual environments, covering the specific requirements of operators (Cordis 2024). Firstly, the URBANIZED project is developing a novel e-powertrain platform that is both, scalable and modular, and developed with component right-sizing (Cordis 2023b). Moreover, the adaptability of its interchangeable multipurpose modular cargo bodies means URBANIZED solutions easily adapt to the fluctuating demands in logistics (Cordis 2023b). Thereby, it delivers outputs in 3 dimensions: 1) high-performance e-powertrain components and control architectures, using advanced co-design approaches; 2) interchangeable, plug & play cargo modules for different urban freight transport use case scenarios and 3) integrated energy and fleet management strategies using data, connectivity and learning algorithms (Cordis 2024).

According to URBANIZED (2023), modular delivery vehicles are the answer to the rapidly changing environment of last-mile delivery, in which logistics operators must adapt to new logistics and business models. The URBANIZED modular delivery vehicle can cover a wider variety of innovative logistics models. It can simply and yet effectively remove the cargo-body from the vehicle frame and rapidly attach a different type of cargo-body (i.e. within minutes) (URBANIZED 2023). This modular delivery vehicles could be in particular interesting for application in shared and reverse logistics models, facilitating existing ideas and enabling ideation of additional novel logistics concepts (URBANIZED 2023).

Without the cargo compartment, the vehicle is 4.2 metres long, almost 1.4 metres wide and about 2 metres high. It has a range of 200 kilometres and an on-board charger that takes six hours to be recharged (McHugh 2024). Double modularity, through compartmentalised and swappable multipurpose cargo bodies offers an easy use and flexibility needed to explore innovative logistics operations (Cordis 2023b). It offers new solutions for consolidating goods in parcel lockers and new urban logistic hubs, whilst

reducing oversized fleets that serve fluctuating demands of different logistics streams (Cordis 2023b). Additionally, an integrated multi-level energy management system optimises the cloud vehicle interconnection to maximise energy savings, occupant comfort and vehicle travel time in case of time-sensitive tasks (Cordis 2023b).

URBANIZED is now in its testing and validation stage, aiming to have a fully tested demonstrator fit for operation in urban environments (Cordis 2023b). The new vehicle will be demonstrated in two specific pilots: last-mile parcel delivery operations (with BPost in Belgium); and HoReCa and on-demand (time-sensitive) service with auxiliary tooling power needs (with Coffee Island in Greece) (Urbanized 2022).

At the end of January 2024, the Belgian national postal service Bpost began delivering some mail in an URBANIZED electric vehicle with a detachable cargo compartment. This test by Bpost is part of the URBANIZED research project and the aim is to extensively test the prototype in real conditions (McHugh 2024). The vehicle, called ASTRID, is being used on seven of 182 rounds in central districts and according to Bpost, the test has so0 far not encountered any significant troubles (McHugh 2024). While the current focus is on logistics in Brussels, the company is weighing the eventual possibility of deploying the URBANIZED prototype more widely in Belgium (McHugh 2024). An optimistic scenario would suggest that by 2030, more than 15,000 URBANIZED vehicles will be adopted by fleet managers (Urbanized 2022).

5. Conclusion

Over 70% of EU citizens live in urban areas and at the same time, 23% of the EU's total transport sector's GHG emissions are emitted in urban areas. To achieve the EU's objectives of a 55% reduction of CO_2 emissions by 2030 and climate neutrality by 2050 also urban freight transport needs to become sustainable. Considering the recent efforts to improve air quality in urban areas by introducing the Urban Vehicle Access Regulation UVAR to tackle carbon emissions and air pollution, the urban areas are pushing the transition towards alternatively fuelled vehicles.

This also includes the electrification of the first and last mile of urban freight transport (UFT) as one of the key initiatives for urban areas, as it could reduce total road transport carbon emissions by at least 3%, while also bringing other benefits such as quieter cities and reducing the urban areas' air pollution.

A newly developed e-LCV, developed and tested by the EU funded URBANIZED project is expected to show high potential for urban delivery operators and to improve freight delivery for the last mile of freight delivery service in urban areas.

The URBANIZED project's overarching objective is to introduce a new modular, flexible, and all-electric vehicle platform for commercial use with a high-performance e-powertrain, which allows for a variety of different urban freight transport uses. Based on a modular cargo space concept, the e-LCV can achieve greater flexibility and adaptability, making this e-LCV a solution for a larger range of on-demand urban freight transport services, thereby substantially improving last-mile delivery operations.

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