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Sustainable Urban Logistics Planning in the V4 countries – A comparative analysis

While the number of studies on sustainable urban mobility—and logistics in particular—is growing, a comparative analysis of logistics planning in the V4 countries reveals a research gap. This study examines the attitudes toward sustainable logistics planning in the countries of the Visegrad Group. One of the key areas of urban development is urban logistics, which causes numerous negative environmental impacts. The innovations of the 21st century that are bringing about radical change — including the use of autonomous vehicles and technologies — contribute to its sustainable transformation. A comparative content analysis of relevant national and local planning documents revealed that the logistics planning practices of the V4 countries follow a similar trajectory. Although the integration of self-driving technologies into freight transport appears only sporadically in strategic documents, emission reduction and the promotion of intermodal solutions can be identified as a unified, consistent objective.
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Introduction

The planning of logistics processes is a key area of sustainable urban development (Kiba-Janiak, 2017; Witkowski & Kiba-Janiak, 2014). However, urban development planning documents typically focus on passenger transport (Behrends et al., 2008; Letnik et al., 2018), and local governments—lacking colleagues with the necessary know-how and logistical expertise—participate little or not at all in shaping urban freight transport processes (Lindholm, 2010). The European Union has formulated directives to support efficient, safe, and sustainable road transport and has set a target of reducing transport-related emissions by 90 percent by 2050. In the Czech Republic, Slovakia, and Poland, the contribution of road transport to air emissions increased between 2014 and 2023, while Hungary saw a slight decrease (EUROSTAT, 2026).

Modern urban freight transport systems must simultaneously adapt to the demand pressures arising from global urbanization and to shifting consumer preferences in the wake of the pandemic, while minimizing the negative externalities resulting from their operations, e.g. traffic congestion and traffic safety risks. Sustainable urban logistics models are needed to reduce current negative externalities (Taniguchi, 2014; Russo & Comi, 2012; Kiba-Janiak, 2017). Meanwhile, during the transition to autonomous vehicles, it is crucial to prepare for innovation and engage in strategic planning (Ayyildiz & Erdogan, 2024), yet international research today consistently finds that there is currently a huge gap between the theory and practical application of introducing autonomous technologies into urban logistics (Mills et al., 2021; Mohsen, 2024; Balázs-Kalász & Rostás, 2026).

There is a research gap regarding the comparison of urban logistics planning in the countries of the Visegrad Four Group, although, their similarities—such as their shared historical past and their similar cultural, economic, and social structures—provide a good basis for comparing them. In the V4 countries, the contribution of the transportation and warehousing sector to GDP has typically been higher than the EU average since the 2010s, ranging between 5% and 7% (KSH, 2022). In the V4 countries (and on average across the EU as well), approximately three-quarters

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of inland freight transport takes place by road. Over the past decade, the share of road freight transport has risen steadily in the Visegrad Group countries (*Figure 1*).

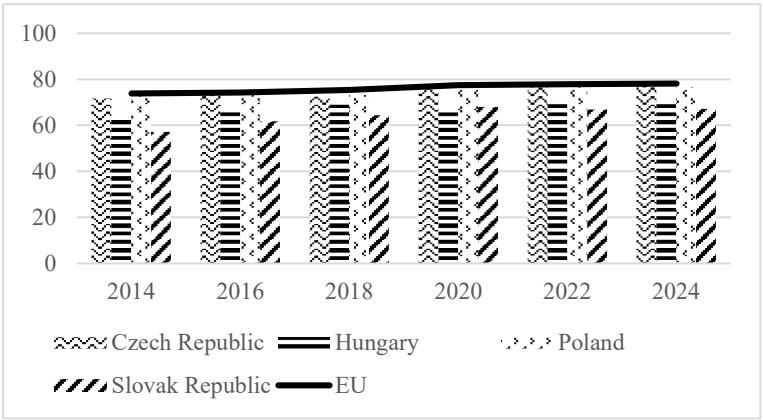

Figure 1. The share of road freight transport in total inland freight transport in the V4 countries (%)
Source: Compiled by the author based on Eurostat data

Literature review

Strategic planning documents for the urban logistics sector cover the flow of goods, services, and related information, and define objectives and associated tasks (Kiba-Janiak, 2019). Municipalities with long-term, strategic urban logistics plans participate more actively in shaping logistics processes than those without such plans (Bjørgen et al., 2022; Kiba-Janiak, 2017). At the supranational level, the EU initially placed emphasis on regions, but from the mid-90's the focus shifted to urban development (URBAN programs 1994–2006, Aalborg Charter 1994, URBACT program 2003, EUKN program 2004). The 2007 Leipzig Charter on Sustainable European Cities encompasses the key aspects of the integrated economic, social, and environmental development of cities and their surrounding areas. The document was updated in 2020 (New Leipzig Charter, EC, 2020), reaffirming the importance of the sustainable development of cities and functional urban areas and the resilience of cities (Barta, 2009). In line with its climate protection goals, the EU has established a legal and regulatory framework that also applies to the sustainable development of urban logistics. In the key strategic planning documents related to this (White Paper, 2011; 2030 Agenda, 2015), the common objectives are the use of renewable energy sources and new technologies, as well as making cities more livable. Subsequently, the EU introduced the framework for Sustainable Urban Mobility Plans (SUMP) (COM, 2013) and Sustainable Urban Logistics Plans (SULP) (EC, 2019) for Functional Urban Areas and mandated the preparation of a SUMP for every major EU city with a population of over 100,000 located along a TEN-T route. It also recommends that Member States designate a national SUMP contact point and establish a national SUMP program (EC, 2024). The SUMP and SULP concepts constitute a unified methodology aimed at supporting European cities in sustainable urban development. But despite the developed and adopted SUMP documents, cities are on different paths during the sustainable transition, and the implementation of the plan's provisions also varies by city. There is no universal model for future urban logistics that can be applied to every city; instead, different scenarios characterize each city and functional urban area (Toy et al., 2025).

The SULP methodology aligns with the SUMP methodology. The European Union's programs promoting SULP adaptation: ENCLOSE (2012–2014), NOVELOG (2015–2018), and SULPITER (2016–2019) were established to understand urban logistics problems and challenges and to facilitate effective, coordinated logistics planning. The SULPITER program supports

decision-makers in shaping a sustainable regulatory framework for logistics processes, improving efficiency and reducing costs, and sharing best practices.

One key means of achieving sustainable economic, social, and environmental goals is the development of innovative transportation systems (Moradi et al., 2025). One of the radical innovations of the fourth industrial revolution, also known as Industry 4.0, is autonomous vehicle technology, which is "so specialized and new that it cannot be compared to any other known urban innovation" (Lukovics et al., 2025, 6). The benefits of deploying self-driving vehicles in passenger and freight transport include *transportation benefits* (e.g. less congestion, reduced traffic, shorter transit times), *economic benefits* (lower costs for transport companies, increased efficiency), and *enhanced safety and environmental protection* (Milakis et al., 2017; Bucsky, 2018; Bagloee et al., 2016; Fagnant & Kockelmann, 2015; de Leo & Miragliotta, 2026). In their research, Yuan et al. (2026) modeled the route planning challenges of last-mile deliveries and concluded that the combined use of cargo bikes and autonomous robots reduces delivery costs by 32–46%, depending on the robots' speed. At the same time, the international literature identifies numerous challenges associated with the adoption of autonomous vehicles, and some studies even predict an increase in costs and delivery route lengths (Auld et al., 2017). One of the autonomous driving technologies in the road freight transport are the "platoons". The trucks connected in a "platoon" means that, only the lead truck has a driver; the rest are self-driving (Bhoopalam et al., 2018). Further solutions for autonomous urban road freight transport are the sidewalk robots or the full autonomous trucks (Rodrigue, 2024).

Methodology

The reviewed urban logistics planning literature forms the basis for the secondary research underlying the present study, which is a qualitative comparative document analysis of mobility and logistics planning documents at various levels in the Visegrad Group countries: Poland, the Czech Republic, Slovakia, and Hungary. The qualitative document analysis based on keywords is suitable for uncovering deeper connections and even identifying new directions during the analysis; however, its subjective nature may skew the results (Géring, 2014). The aim of comparative document analysis is to identify what urban logistics content appears in the national-level mobility plan documents of the V4 countries under study and in the SUMP plan documents of the V4 capitals. The list of keywords was determined deductively, based on a prior analysis of the international literature (Babbie, 2001). Keywords are linguistic elements that provide information about the content of a text (Berend et al., 2013). The following 10 keywords and their word stems were used for analysis: logistics; urban; city; freight transport; transport; cargo transport; road; smart city; autonomous; self-driving.

V4 countries' shared historical past and similar cultural, economic, and social structures provide a smooth foundation for comparing the urban logistics aspects of their national-level planning documents and for conducting a comparative analysis of the SUMP and SULP documents of the V4 capitals. Of the capitals of the V4 countries, Budapest is the only one to have a Sustainable Urban Logistics Plan. Consequently, in the absence of such a plan, the SUMP documents for Warsaw, Prague, and Bratislava, and the SULP document for Budapest, were examined. Key factors determining the state of urban logistics planning are the involvement of the decision-making in shaping urban freight transport processes and the nature of sector-specific measures, such as the existence, method, and frequency of data collection, or the presence of urban freight transport in strategic documents (Lindholm, 2010; Letnik et al., 2018; Cowie & Fisken, 2023).

Sustainable Urban Logistics Planning in the Visegrád Group Countries

An Analysis of National-Level Planning Documents included urban logistics content in the V4 Countries

The analyzed documents establish strategic pathways for future logistics, offering crucial directives for optimizing freight movement in V4 countries.

The Transport Policy of the Czech Republic (2021) encompasses several sustainable transport strategies. These include, among others, the Public Transport Strategy and the Freight Transport Strategy. The document includes a separate action plan for the introduction of autonomous driving technologies. The country is striving to take advantage of the opportunity for infrastructure developments to also incorporate the smart systems necessary for connecting transport networks. Autonomous driving technologies are characterized as a global trend. The Strategy for the Development of Intelligent Transport Systems (2020) focuses on the development of logistics hubs and infrastructure and encourages intermodal solutions. It notes that Intelligent Transport Systems are already available to logistics market stakeholders and that the state can influence them primarily through research and development, standardization, and legislation, while refraining from intervening in the operational management of freight transport. The use of alternative propulsion systems also receives special attention.

Hungary's Transport Development Concept (2024) sets out mobility objectives and related measures. It does not include a specific plan for freight transport, but it does contribute indirectly to the development of the logistics sector. The review of the National Transport Infrastructure Development Strategy (2014) began in December 2025, with the involvement of relevant stakeholders. The plan emphasizes the importance of infrastructure development, particularly in connection with the TEN-T network, and notes that data collection in the field of mobility is also crucial, as it provides a foundation for strategic planning. The Hungarian National Logistics Concept (2030–2035)[20] was completed by the end of 2025, which would make Hungary the logistics distribution hub of the Central and Eastern European region (the relevant planning documents of the Czech Republic and Slovakia also aim for the same). In line with EU directives, the new Hungarian national-level logistics planning document places great emphasis on the use of shared modes of transport and alternative energy, as well as the development of intermodal networks.

In Poland—as in the other V4 countries and the EU as a whole—great emphasis is placed on promoting intermodality and electromobility, as evidenced by logistics planning documents. Infrastructure developments are primarily linked to TEN-T corridors. The National Urban Policy (2022) supports sustainable urban mobility at the national level and assists Polish cities in adapting their SUMPs.

In its Strategic Mobility Development Plan (2016), Slovakia set out development paths for sustainable passenger and freight transport and improvements in the efficiency of road and rail transport by 2030 *(Table 1*).

[20] The full document is not yet available online. Source: Logistics Coordination Forum – Presentation of the National Logistics Concept 2030

Table 1. National-level planning documents in the V4 countries that partially address urban mobility and urban logistics

	Document name	Document type	Urban mobility components of the document
Czech Republic	Transport Policy of the Czech Republic 2021-2027 (with an outlook until 2050)	mobility plan document with some logistical content	sustainable passenger and freight transport; urban freight transport is less organized than passenger transport; urban freight transport is more polluting than passenger transport; the proportion of kilometers traveled with empty vehicles or carrying small loads is high in freight transport; Intelligent Transport Systems; preparing for autonomous technologies
	Action Plan for the Deployment of Intelligent Transport Systems (ITS) in the Czech Republic until 2020 (with the Prospect of 2050)	mobility plan document with some logistical content	transit country; development of logistics hubs; efficiency improvement; infrastructure development; promotion of intermodality; Intelligent Transport Systems
Hungary	Transport Development Concept 2023-2035	mobility plan document with some logistical content	developing a sustainable, efficient, and modern transportation system
	National Transport Infrastructure Development Strategy 2014-2019 (its review started in 2025	mobility plan document with some logistical content	supporting and integrating passenger and freight transport segments and modes that are more socially beneficial; improving the quality and efficiency of transport services; improving transport infrastructure
	National Development 2030 – National Development and Spatial Planning Concept 2014-2020	comprehensive development plan	comprehensive, long-term development objectives in line with the EU's development objectives
	National Logistics Concept 2030-2035	logistics plan document	rail, intermodal, and digital developments; Hungary as a Central European logistics hub; reducing greenhouse gas emissions; promoting renewable energy
Poland	Strategy for Sustainable Transport Development 2019-2030	mobility plan document with some logistical content	the need for a sustainable transportation system in Polish cities, the modernization of public transportation; promoting electromobility
	National Urban Policy 2022-2030	mobility plan document with some logistical content	focuses on the development of cities and FUA; mitigating negative externalities; encouraging the development of SUMP documents
Slovak Republic	Strategic Transport Development Plan of the Slovak Republic (Phase II.) 2016-2030	mobility plan document with some logistical content	improving the efficiency of road and rail transport; sustainable passenger and freight transport

Source: own compilation based on EC (2023) and document analysis

A comparison of the V4 countries' national-level planning documents on mobility, with a focus on logistics, has shown that the four countries currently are on a similar path in the field of

logistics planning. While each planning document includes urban logistics objectives, the focus remains on passenger transport. Yet, as the Czech Transport Policy document also points out: urban freight transport places an even greater burden on the environment than passenger transport, and while many measures have been taken in the latter area to reduce pollutant emissions, freight transport has been sidelined in this regard. The secondary research also revealed that Hungary, the Czech Republic, and Slovakia all envision their countries playing the role of a Central European logistics hub. The implementation of autonomous vehicles typically does not appear in the planning documents of the V4 countries examined.

A Comparative Analysis of the SUMP and SULP Planning Documents of the V4 Capitals

According to a study by Böhler, Huaylla and Felton, (2021), 68% of European cities—85 out of 125 municipalities surveyed—are aware of the European guidelines on sustainable urban logistics plans; awareness is higher among medium-sized and large cities. However, only 29% of the cities participating in the study collect data on urban logistics. At the same time, despite the unified EU framework, the quality of SUMP documents varies from city to city. Some cities have integrated the document into urban planning in a comprehensive, city-specific manner, while others have filled it with general content (Süle et al., 2026). An analysis of the V4 countries shows that, except of Slovakia, approximately 4–5% of cities in each country have adopted SUMP documents as part of an environmentally conscious mobility strategy.

In the Slovak Republic, only two cities have adopted a SUMP document: Bratislava and Košice. In the Czech Republic, every city with a population of over 40,000 has a SUMP document; in Hungary, 27 cities have one (*Figure 2*), and in Poland, 45 cities have one (EU, SUMP Database, 2025).

Figure 2. Hungarian cities with a SUMP document and the road routes of the TEN-T network in Hungary
Source: own compilation of the author

It should be noted, however, that since 2015, the existence of a SUMP document has been a prerequisite for accessing grants from the Cohesion Fund. Logistics planning is generally overshadowed within urban planning, and local governments typically have less experience in planning urban logistics processes than in planning passenger transport (Behrends et al., 2008; Dablanc, 2007; Paddeu, 2017; Kerwall et al., 2026). Consistent with this, in Hungary and Poland, only one city each (Budapest and Poznań) has a Sustainable Urban Logistics Plan, while in

Slovakia and the Czech Republic, no city has yet developed a SULP document (*Table 2*). At the same time, Hungarian cities with populations exceeding 100,000 typically have a low level of sustainable logistics planning (Madarász & Smahó, 2025).

Table 2. Number of cities in the V4 countries that have adopted SUMP and SULP documents

	Number of cities with a SUMP or a simplified SUMP	Percentage of cities with a SUMP or a simplified SUMP	Number of cities with a SULP document
Czech Republic	27	4,29%	0
Hungary	27	7,76%	1
Poland	45	4,98%	1
Slovak Republic	2	1,45%	0

Source: Compiled by the author based on the EU SUMP database (2025)

The SUMP document for the Polish capital (Warsaw SUMP, 2023) includes a section on urban logistics that is closely linked to the Polish sections of the TEN-T network. The plan emphasizes the importance of urban logistics planning for efficient, functional, and safe freight transport. Overall, it can be said that the regulation of new technologies related to freight transport is less prominent in Polish law, even though the technological revolution is a significant factor in the transformation of road freight transport. In Poland, one city has a Sustainable Urban Logistics Plan (Poznań SULP, 2019). The document addresses the logistical applications of self-driving vehicles and the need for related specialized infrastructure preparations, while also emphasizing that this technology is currently still in the testing phase in Europe. In preparation for autonomous urban freight transport, the document contains forward-looking plans. An electronically accessible loading bay management system for self-driving vehicles will make inner-city logistics more efficient and give city center spaces new functions. The online platform outlined in the plan improves the balance between supply and demand in urban logistics, allowing industry players to exchange information about needed shipments or their available capacity, thereby helping to optimize urban freight transport. The interactive map proposed in the plan document also effectively reduces emissions and costs by providing carriers with real-time traffic information to support route planning. The SULP document discusses in detail new autonomous logistics solutions, such as autonomous robots and small autonomous urban vehicles. The logistics document highlights the advantages of mini-hubs when combined with autonomous vehicles. The mini-hubs or micro-hubs are logistics facilities inside the urban area for consolidating the goods and allowing a shift mode to environmentally friendly transport modes, e.g. e-van or cargo bikes (Urban Freight Lab, 2020). Their financial advantage lies in reduced costs, as retailers need to maintain smaller inventories in expensive downtown rental spaces, since the proximity of the transfer centers allows them to receive ordered goods very flexibly and quickly during the last mile, and for a minimal fee, they can also arrange for order fulfillment or return logistics. The social benefit of this type of supply chain transformation is a better quality of urban life.

Prague's Sustainable Urban Mobility Plan (Praha SUMP, 2019) proposes, in the long term, the creation of a freight transport specialist position within local planning to make cooperation among stakeholders more effective and enable the municipality to fulfill its coordinating role more successfully. In line with EU objectives, the Czech urban mobility plan also encourages stakeholders in the sector to adopt intermodal and integrated logistics solutions; however, the issue of the logistics application of self-driving vehicles is not addressed.

Bratislava's Sustainable Urban Mobility Plan (SUMP) was established in 2020 for the entire Bratislava region (Bratislava SUMP, 2020). This plan does not focus on freight transport (nor is that its purpose), nor does it mention preparations for autonomous urban logistics, but it does

highlight the need for smart transport solutions and the importance of information and communication technologies.

The logistics plan for the Hungarian capital (Budapest SULP, 2018) also mentions the creation of a so-called Living Lab, where urban logistics systems and new technologies can be tested in real time. "In Living Labs, physical and financial spaces for experimentation are facilitated to introduce and test new governance approaches, technologies, or practices through interventions and experiments with the aim of purposefully re-shaping social and material realities towards sustainability solutions" (Yilmaz et al., 2026, 1). The logistics plan also includes important IT innovations, such as virtual consolidation centers (VCCs), a loading bay reservation system, smart poles, and real-time traffic information systems. VCCs are for IT-based consolidating the goods without physical presence of them, while a loading bay reservation system supports the stakeholders, above alle carriers prebooking slots for loading and unloading and avoiding long waiting times. Smart poles and real-time traffic information systems enable the real-time data sharing and therefore enhance the effectivity of urban transport. Like Poznań's sustainable logistics plan, Budapest's logistics plan also includes smart loading zones, which are available during designated time slots, even for small self-driving electric vehicles. Shared parking and loading zones are also intended to improve land use in the city center.

Based on the content of their SUMP and SULP documents, a similar attitude characterizes the municipal governments of the Visegrad Group capitals regarding urban logistics planning. The application of self-driving technologies in freight transport appears only sporadically; however, reducing emissions and promoting intermodality and e-solutions can be identified as common goals in all urban mobility planning documents. *Table 3* shows the main similarities and differences found regarding the logistics planning of the V4 counties.

Table 3. Main similarities and differences of logistics planning among the V4 countries

Similarities	**Differences**
- following the EU-framework	- level of the adoption of SUMPs
- enhancing the sustainability goals	- proportion of adopted SUMPs
- aiming reduction of emission	- level of document embedding
- use of IT-based solutions	
- targeting the use of e-vehicles or cargo-bikes	
- autonomous vehicles are just mentioned	

Source: own compilation of the author

Summary

A comparative analysis of national-level mobility and logistics planning documents within the Visegrad Group (V4) indicates a high degree of convergence in strategic planning paths. While integrated urban logistics objectives are present in the analyzed documentation, empirical findings suggest that passenger mobility remains the predominant focus, often sidelining the substantial environmental externalities associated with urban freight transport. The Czech Transport Policy exemplifies a recognition that urban freight logistics generate a higher relative burden on the environment than passenger mobility; however, targeted emission-reduction measures for freight remain underrepresented compared to passenger transport efforts. Secondary analysis highlights a shared strategic ambition among Hungary, the Czech Republic, and Slovakia to establish themselves as regional logistics hubs in Central Europe. Furthermore, the strategic adoption of autonomous vehicles (AVs) and self-driving technologies in freight transport is currently sporadic,

appearing infrequently in the formal planning documents of the V4 nations examined. Finally, evaluation of Sustainable Urban Mobility Plans (SUMP) and Sustainable Urban Logistics Plans (SULP) demonstrates that municipal governments in V4 capitals align with their national counterparts, exhibiting similar attitudes toward urban logistics. Notwithstanding the focus on passenger travel, the optimization of freight emissions, the promotion of intermodality and the use of electric vehicles as well as the enhancing of low-emission urban zones and introduction of smart loading bays are identified as common objectives across the urban mobility strategies of the Visegrad Group cities. A common characteristic in the logistics planning of the V4 countries is also the adaptation of the related EU-framework, although it is diversified by countries.

Regardless of the decision-making level or stakeholder involved, it is in everyone's common interest that the transition to sustainable (and autonomous) urban logistics take place in a way that maximizes the benefits and minimizes the drawbacks as much as possible. This requires a value-adding preparatory work supported by this research. A new approach is needed in urban logistics planning; local governments no longer play merely a regulatory role but are proactive participants in the ecosystem, and cities are involved in transforming urban logistics processes in line with sustainability and professional considerations. Preparing to embrace innovations reduces the risks associated with them and increases the chances of capitalizing on their potential, including in the field of urban logistics. Local governments would be well advised to proactively prepare for the implementation of new technologies in the urban logistics sector as well.

References

Action Plan for the Deployment of Intelligent Transport Systems (ITS) in the Czech Republic until 2020 (with the Prospect of 2050), https://md.gov.cz/Dokumenty/Strategie/ITS/Akcni-plan-rozvoje-inteligentnich-dopravnich-syste?lang=en-GB

Auld, J., Sokolov, V. & Stephens, T.S., (2017). Analysis of the effects of connected–automated vehicle technologies on travel demand. *Transportation Research Record: Journal of the Transportation Research Board, 2625*(1), 1–8. https://doi.org/10.3141/2625-01

Ayyildiz, E., & Erdogan, M. (2024). Addressing the challenges of using autonomous robots for last-mile delivery. *Computers & Industrial Engineering*, 190, 110096. https://doi.org/10.1016/j.cie.2024.110096

Az Európai Unió SUMP adatbázisa (2025). *EU city database – Sustainable Urban Mobility Plans (SUMPs).* https://urban-mobility-observatory.transport.ec.europa.eu/sustainable-urban-mobility-plans/eu-city-database-sumps_en?prefLang=hu

Babbie, E. (2001). *A társadalomtudományi kutatás gyakorlata.* Balassi Kiadó. Budapest

Bagloee, S. A., Tavana, M., Asadi, M., & Oliver, T. (2016). Autonomous vehicles: Challenges, opportunities, and future implications for transportation policies. *Journal of Modern Transportation, 24*(4), 284–303. https://doi.org/10.1007/s40534-016-0117-3

Balázs-Kalász, A., & Rostás, S. (2026). Digitális érettség és szervezeti alkalmazkodóképesség a magyar és DACH-régiós építőipari gépkereskedelemben [Digital maturity and organizational adaptability in Hungary and the DACH region's construction machinery trading]. *Észak-magyarországi Stratégiai Füzetek, 23*(1), 58–68. https://doi.org/10.32976/stratfuz.2026.5

Barta, Gy. (2009). Integrált városfejlesztési stratégia: A városfejlesztés megújítása. *Tér és Társadalom, 23*(3), 1–12. https://doi.org/10.17649/TET.23.3.1253

Behrends, S., Lindholm, M., & Woxenius, J. (2008). The impact of urban freight transport: A definition of sustainability from an actor's perspective. *Transportation Planning and Technology, 31*(6), 693–713. https://doi.org/10.1080/03081060802493247

Berend, G., Farkas, R., Vincze, V., Zsibrita, J., & Jelasity, M. (2013). Kulcsszókinyerés alapú dokumentumklaszterezés. In *IX. Magyar Számítógépes Nyelvészeti Konferencia* (pp. 251–262).

Bhoopalam, A. K., Agatz, N., & Zuidwijk, R. (2018). Planning of truck platoons: A literature review and directions for future research. *Transportation Research Part B: Methodological, 107*, 212–228. https://doi.org/10.1016/j.trb.2017.10.016

Bjørgen, A., & Ryghaug, M. (2022). Integration of urban freight transport in city planning. *Transportation Research Part D: Transport and Environment, 107*, 103310. https://doi.org/10.1016/j.trd.2022.103310

Böhler, S., Huaylla, K., & Felton, P. (2021). *The current status and experience of SULPs in Europe.* Urban logistics as an on-demand service. https://ulaads.eu/wp-content/uploads/2022/02/ULaaDS_webinar_presentations_10.02.22.pdf

Bucsky, P. (2018). Autonomous vehicles and freight traffic: Towards better efficiency of road, rail or urban logistics? *Urban Development Issues, 58*, 41–51. https://doi.org/10.2478/udi-2018-0022

Budapest SULP (2018). Budapest Fenntartható Városi Logisztikai Terve (SULP) (2018). Megalapozó dokumentum. https://www.budcluster.eu/wp-content/uploads/2015/11/Budapest-Fenntarthat%C3%B3-V%C3%A1rosi-Logisztikai-Terve.pdf

COM (2013). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Together towards competitive and resource-efficient urban mobility, Brussels,* 17.12.2013 (COM (2013) 913 final, Annex 1). https://eur-lex.europa.eu/resource.html?uri=cellar:82155e82-67ca-11e3-a7e4-01aa75ed71a1.0011.02/DOC_4&format=PDF

Cowie, J., & Fisken, K. (2023). Urban freight policy maturity and sustainable logistics: Are they related? *Journal of Shipping and Trade, 8*, Article 5. https://doi.org/10.1186/s41072-023-00133-0

Dablanc, L. (2007). Goods transport in large European cities: Difficult to organize, difficult to modernize. *Transportation Research Part A: Policy and Practice, 41*(3), 280–285. https://doi.org/10.1016/j.tra.2006.05.005

De Leo, G., & Miragliotta, G. (2026). Barriers to autonomous vehicles adoption in Europe: Insights from literature and interviews. *Journal of Urban Mobility, 9*, 100194. https://doi.org/10.1016/j.urbmob.2026.100194

EC (2019). Sustainable Urban Logistics Planning. Topic Guide, European Commission, Brussels. https://urban-mobility-observatory.transport.ec.europa.eu/system/files/2023-11/sustainable_urban_logistics_planning.pdf

EC (2023). EU Urban Mobility Observatory https://urban-mobility-observatory.transport.ec.europa.eu/sustainable-urban-mobility-plans/member-state-profiles/poland_en

EC (2024). Sustainable Urban Mobility Planning and Monitoring, European Commission. https://transport.ec.europa.eu/transport-themes/urban-transport/sustainable-urban-mobility-planning-and-monitoring_en

Európai Bizottság. (2011). *Fehér könyv: Útiterv az egységes európai közlekedési térség megvalósításához – Úton egy versenyképes és erőforrás-hatékony közlekedési rendszer felé.* Brüsszel, 2011.03.28.

Eurostat. (2026). *Air emissions accounts related to road transport by NACE Rev. 2 activity*. https://ec.europa.eu/eurostat/databrowser/view/env_ac_ainah_rd/default/table?lang=en&category=env.env_air.env_air_aa

Fagnant, D. J., & Kockelman, K. (2015). Preparing a nation for autonomous vehicles: Opportunities, barriers and policy recommendations. *Transportation Research Part A: Policy and Practice, 77*, 167–181. https://doi.org/10.1016/j.tra.2015.04.003

Géring, Zs. (2014). Tartalomelemzés: A virtuális és a „valós" világ határán. Egy vállalati honlap-elemzés bemutatása. *Kultúra és Közösség, 5*(1), 9–24.

Kiba-Janiak, M. (2017). Urban freight transport in city strategic planning. *Research in Transportation Business & Management, 24*, 4–16. https://doi.org/10.1016/j.rtbm.2017.05.003

Kiba-Janiak, M. (2019). EU cities' potentials for formulation and implementation of sustainable urban strategic plans. *Transportation Research Procedia, 39*, 150–159. https://doi.org/10.1016/j.trpro.2019.06.017

KSH. (2022). *A Visegrádi Együttműködés országainak főbb mutatói*. https://www.ksh.hu/docs/hun/xftp/idoszaki/pdf/v4_fobbadatok_2022.pdf

Letnik, T., Marksel, M., Luppino, G., Bardi, A., & Božičnik, S. (2018). Review of policies and measures for sustainable and energy efficient urban transport. *Energy, 163*, 245–257. https://doi.org/10.1016/j.energy.2018.08.096

Lindholm, M. (2010). A sustainable perspective on urban freight transport: Factors affecting local authorities in the planning procedures. *Procedia - Social and Behavioral Sciences, 2*(3), 6205-6216. https://doi.org/10.1016/j.sbspro.2010.04.031

Lipcsei Charta a fenntartható európai városokról. (2007). https://2010-2014.kormany.hu/download/d/fd/30000/lipcsei_charta.pdf

Lukovics, M., Kovács, P., & Smahó, M. (2025). Assessing the Readiness of Hungarian cities for autonomous vehicles. *Cities 165,* 106120. https://doi.org/10.1016/j.cities.2025.106120

Madarász, E. Zs., & Smahó, M. (2025). Fenntartható logisztikai tervezés a magyar nagyvárosokban. *Comitatus Önkormányzati Szemle, 35*(255), 85-98. https://doi.org/10.59809/Comitatus.2025.35-255.85

Magyar Közlekedésfejlesztési Koncepció 2023-2035. (2024). *Magyar Közlöny, Magyarország Hivatalos lapja, 2024*(102), 7253-7259.

Milakis, D., Snelder, M., van Arem, B., van Wee, B., & Correia, G. (2017). Development and transport implications of automated vehicles in the Netherlands: Scenarios for 2030 and 2050. *European Journal of Transport and Infrastructure Research, 17*(1), 63–85. https://doi.org/10.18757/ejtir.2017.17.1.3180

Mills, D., Pudney, S., Pevcin, P., & Dvořák, J. (2021). Evidence-based public policy decision-making in smart cities: Does extant theory support achievement of city sustainability objectives? *Sustainability, 14*(1), 3. https://doi.org/10.3390/su14010003

Mohsen, B.M. (2024) AI-driven optimization of urban logistics in smart cities: Integrating autonomous vehicles and IoT for efficient delivery systems. *Sustainability, 16*(24), 11265. https://doi.org/10.20944/preprints202409.0396.v1

Moradi, N., Kayvanfar, V. & Baldacci, R. (2025). Autonomous Delivery vehicles in two-echelon routing for sustainable last-mile logistics. *IFAC-PapersOnLine, 59*(10), 2598–2603. https://doi.org/10.1016/j.ifacol.2025.09.437

National Urban Policy Poland (2022). *The Ministry of Development Funds and Regional Policy, Department of Strategy*. https://www.gov.pl/web/fundusze-regiony ISBN: 978-83-7610-724-0

Nemzeti Fejlesztés 2030: Országos fejlesztési és területfejlesztési koncepció. (2014). *Magyar Közlöny*, *2014*(1), 7-299.

Nemzeti Közlekedési Infrastruktúra Stratégia (2014). Stratégia dokumentum, Stratégia Konzorcium https://2015-2019.kormany.hu/download/3/a8/10000/Nemzeti%20Közlekedési%20Infrastruktúra-fejlesztési%20Stratégia.pdf

New Leipzig Charter: The transformative power of cities for the common good. (2020). https://ec.europa.eu/regional_policy/en/information/publications/brochures/2020/new-leipzig-charter-the-transformative-power-of-cities-for-the-common-good

Paddeu, D. (2021). The five attribute performance assessment (FAPA) model to evaluate the performance of an urban consolidation centre. *Research in Transportation Economics, 90*, 101065. https://doi.org/10.1016/j.retrec.2021.101065

Plán udržitelné mobility Prahy a okolí. (2020). https://sump-central-eu/wp-content/uploads/2020/SUMP-Prag.pdf

Plan zrównoważonej mobilności miejskiej dla Metropolii Warszawskiej 2030. (2023). (2023). https://omw.um.warszawa.pl/wp-content/2023/06/SUMP-MW-1.pdf

Poznan SULP Policy Document (2019) Interreg Central Europe SULPITER https://programme2014-20.interreg-central.eu/Content.Node/SULPiTER/D.T3.2.5.SULP-POLICY-DOCUMENT-Poznan-FUA.pdf

Regionálny Plán Udrzatel'nej Mobility, Bratislavsky (2020). https://bratislavskykraj.sk/wp-content/uploads/2020/09/plan_udrzatelnej_mobility_navrhova_cast.pdf

Rodrigue, J. P. (2024). *The geography of transport systems* (6th ed.). Routledge. https://doi.org/10.4324/9781003343196

Russo, F., & Comi, A. (2012). City characteristics and urban goods movements. *Procedia - Social and Behavioral Sciences, 39*, 61–73. https://doi.org/10.1016/j.sbspro.2012.03.091

Strategic Transport Development Plan of the Slovak Republic up to 2030 – Phase II (2016) Ministry of Transport, Construction and Regional Development of the Slovak Republic. https://www.opii.gov.sk/download/d/sk_transport_masterplan_(en_version).pdf

Strategy for Sustainable Transport Development to 2030. https://netzerocompare.com/policies/poland-strategy-for-sustainable-transport-development-to-2030-pl-std2030-srt-2030

Süle, E., Florez, M. F., & Horváth, A. (2026). Sustainable urban mobility plans policies and implementation in Europe: Evidence from Vienna, Thessaloniki, Terrassa, Budapest, and York. In M. Dzunić, S. Muratori, & J. Östh (Eds.), *Advancing urban and local governance in Western and transition Europe* (pp. 203–229). Springer. https://doi.org/10.1007/978-3-032-04265-1

Taniguchi, E. (2014). Concept of city logistics for sustainable and liveable cities. *Procedia - Social and Behavioral Sciences, 151*, 310–317. https://doi.org/10.1016/j.sbspro.2014.10.029

The Aalborg Charter (1994). https://sustainablecities.eu/the-aalborg-charter/

Toy, J., Gesing, B., Ward, J., Noronha, J., & Bodenbenner, P. (2025). *The logistics trend radar*. DHL. https://www.dhl.com/us-en/home/innovation-in-logistics/logistics-trend-radar.html

Transport Policy of the Czech Republic for the period of 2021 - 2027, with an outlook until 2050. Resolution of the Government of the Czech Republic of 8 March 2021, No. 259. https://md.gov.cz/getattachment/Dokumenty/Strategie/Dopravni-politika-Ceske-republiky-pro-obdobi-2021/Dopravni_Politika_CR_ENG.pdf.aspx

UN. (2015). 2030 Agenda for Sustainable Development, 2015. (A/RES/70/1). https://docs.un.org/en/A/RES/70/1

Urban Freight Lab. (2020). *Common MicroHub Research Project: Research scan*. https://www.urbanfreightlab.com/publications/common-microhub-research-project-research-scan/

Witkowski, J., & Kiba-Janiak, M. (2014). The role of local governments in the development of city logistics. *Procedia - Social and Behavioral Sciences, 125*, 373–385. https://doi.org/10.1016/j.sbspro.2014.01.1481

Yilmaz, S., Bar, R., Schid, B., Rosset, J., Moser, S., Boogen, N., & Grieder, M. (2026). Developing a summative and integrated framework to assess living lab interventions: Insights and reflections from a multi-site case study. *Environmental Impact Assessment Review, 121*, 108544. https://doi.org/10.1016/j.eiar.2026.108544

Yuan, B., Yang, B., Gang, N., & Baldacci, R. (2026). Improving last-mile delivery efficiency using cargo bikes and autonomous robots. *European Journal of Operational Research, 333*(1), 279–294. https://doi.org/10.1016/j.ejor.2026.01.013