



URBAN MOBILITY IN SLOVAKIA: THE INNOVATION LINE



FOREWORD

Dear reader,

The urban and environmental challenges require us to radically change the way we move and live in cities. Following the European Commission's 2030 Climate Target Plan, 55 % of greenhouse gas emissions have to be cut by 2030 and net zero emissions achieved by 2050. As such, we need to embrace a new paradigm. That includes creating liveable, sustainable and inclusive urban spaces.

EIT Urban Mobility is Europe's leading innovation community for urban mobility, co-funded by the European Union. Cities are at the heart of everything we do. We bring together partners from industry, including start-ups, universities, research institutes, and cities. Together, we develop and deploy new solutions that enable the behavioural change needed to transition to a decarbonised mobility and transport system in Europe.

This report explores the engaging evolution of urban mobility in Slovakia. I encourage you to take this journey to learn more about the development of the urban mobility sector in Slovakia, and how EIT Urban Mobility supports innovative solutions to create more liveable cities.

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THE FUTURE IS URBAN: INTRODUCTION

The vibrant life that cities enable for their citizens attracts an increasing proportion of the world's population. Today, more than 50% of people live in cities and the urban population is expected to increase by 1.5 times 2045.¹ Urbanization has become a significant driver of economic growth, with over 80% of the world's GDP generated in cities. The rapid pace of urbanization presents significant challenges, such as lack of affordable housing, pollution, basic services or viable infrastructure.

Addressing the challenges of urban mobility holistically is more crucial now than ever. The COVID-19 pandemic has further stressed the need for our cities to become resilient and adaptable. The development of comfortable and safe public spaces, improvements in overall air quality, accessible infrastructure, a variety of transport solutions, and increased citizen engagement in decisions relating to urban living are important now and will be even more crucial in the upcoming years.

What is Urban Mobility? The movement of people and goods within urban areas, primarily cities and metropolitan regions, is called urban mobility. It includes various modes, transportation methods, and the systems and infrastructure that support them. Efficient urban mobility is critical for city functioning because it directly impacts economic productivity, environmental sustainability, and residents' overall quality of life.

¹ <https://www.worldbank.org/en/topic/urbandevelopment/overview>

Urban mobility entails a variety of modes of transportation, including cars, public transportation, cycling, and the transition from diesel to electric vehicles. Effective and sustainable urban mobility solutions can significantly improve the quality of life and are critical in mitigating climate change. Urban mobility can make our streets safer, lessen the burden of commuting, and improve accessibility to vital services for more vulnerable groups, such as the elderly and disabled.

Cities serve as living labs where governments, industry stakeholders and academic partners can demonstrate how cutting-edge technologies and new perspectives can revolutionize how people, goods, and even waste move. The transformative potential of innovative mobility solutions is most visible in the dynamic environment of urban life. As Slovakia is on the verge of transportation transformation, it's crucial to make informed decisions and ensure a sustainable and efficient transportation system for the country.

This EIT Urban Mobility report dives deep into emerging local and global trends, with a specific focus on Slovakia's urban mobility landscape. Additionally, the report features interviews with prominent mobility experts who provided valuable insights into the challenges and potential solutions.

BUILDING CITIES FOR CARS OR PEOPLE: A GLOBAL PERSPECTIVE ON CITY DESIGN

Building cities for people, not for cars, involves a fundamental shift in urban design and planning. It requires a focus on creating a more walkable, bike-friendly, and pedestrian-oriented environment, with a reduced emphasis on car-centric infrastructure. This shift involves rethinking urban spaces to prioritize human activities and accessibility, balancing multiple modes of transportation, and adapting to emerging technologies and innovations.

Cities face several challenges when attempting to shift their focus from cars to people in city design. First, historical urban planning models, second, infrastructure already built around cars and third, the influence of automobile industry²³.

² <https://www.strongtowns.org/journal/2018/7/2/we-should-be-building-cities-for-people-not-cars>

Urban landscape historical changes

The surge of cars on the streets necessitated changes in the urban landscape lead to the widening of streets, the creation of more parking lots, and, eventually, the building of high-speed highways cutting through the urban landscape, as we often see now.

In **North America**, for example, the automobile became king: vast landscapes of suburbs sprouted, nearly impossible to navigate without a personal car.

In **Europe**, the growth of urban mobility followed a different path to that of North America. After the Second World War, many European cities faced the monumental task of rebuilding. This presented a unique opportunity for city planners to reimagine urban landscapes. Many cities chose a people-centric approach and focused on rebuilding and reimagining quiet, clean, and safe environments. These cities prioritised pedestrian zones, efficient public transport, and green spaces, setting a standard for modern urban living.

In **Slovakia**, however, it took a different turn. In the 1970s, the Jewish part of Bratislava was destroyed to make way for a new four-lane street and the Most SNP (Bridge of the Slovak National Uprising). It divided the Old Town into two parts and significantly altered the physical landscape of the city, marking a departure from the people-centric design trends observed in many other European cities.

The current initiative of **Bratislava** Mayor Matúš Vallo, to create the Staromestská Plateau above the area that had previously divided the city center is a good step towards overcoming the damage caused by the insensitive intervention of the past. This project, as part of the larger vision to establish the Bratislava Ring, will not only reconnect the Old Town but also restore missing public space, provide greenery, and create a vibrant pedestrian-friendly environment. This endeavor reflects a positive shift towards a more people-centric and culturally sensitive approach to urban development.



Characteristics of a people-centric city

A people-centric city prioritizes the needs and preferences of its residents, ensuring a high quality of life and promoting community engagement in urban planning processes. These cities continue to serve people, and the characteristics of a people-centric city design can be summed in the following points:

1. **Extensive Public Transportation Network** - offering a comprehensive, reliable, and affordable public transportation system.
2. **Pedestrian-Friendly Design** – prioritizing pedestrian areas.
3. **Cycling Infrastructure** - designing dedicated bike lanes, secure bike parking, and bike-sharing services.
4. **Green Spaces and Parks** – making an access to green spaces a priority, with parks, and other green areas integrated into the urban fabric.
5. **Traffic Calming and Reduced Car Dependency** - employing measures to reduce vehicular traffic in central areas, such as low emission zones, limited parking, and congestion charges.
6. **Mixed-Use Development** - integrating residential, commercial, and recreational areas to reduce the need for long commutes
7. **Accessibility for All** - catering the infrastructure and services to people of all ages and abilities.
8. **Community Involvement in Planning** - emphasizing community engagement in urban planning processes, to reflect the resident needs in city policies and developments.
9. **Smart City Technologies** - using technology such as smart traffic lights, sensors for environmental monitoring, and apps for real-time public transport information.

Bratislava and Košice are making significant changes to their city designs and sustainability efforts, with governments and private businesses working together to provide citizens with sustainable and green mobility strategies^{1 2}, many mobility solutions, convenient applications and an extensive public transport network, which we will cover in more detail in the following sections.

Did you know? Bratislava is home to one of the world's oldest tram line, which began operating on the 27th of August in 1895³. This makes Bratislava one of the first cities in Europe to have its own tramway.

Challenges of the car-centric city design

People in cities that primarily focus on accommodating and serving vehicles face several challenges:

1. **Traffic Congestion.** As cities grow and more people rely on cars, roads become increasingly clogged, leading to longer commute times and reduced overall city efficiency.
2. **Environmental Impact.** Car-centric cities contribute to higher levels of air pollution due to vehicle emissions.
3. **Urban Sprawl.** Car-centric planning often results in longer commutes, increased car dependence, and the loss of green spaces.
4. **Safety Concerns.** High volumes of vehicular traffic can be dangerous for pedestrians and cyclists, often leading to higher accident rates.
5. **Social Isolation.** Car-centric designs can reduce opportunities for social interaction in public spaces, contributing to isolation among city residents.
6. **Economic Costs.** The maintenance and expansion of road infrastructure for cars can be extremely costly, diverting funds from other critical urban services and infrastructure.
7. **Reduced Accessibility.** People who cannot afford or do not have a car may struggle to access essential services and opportunities in a car-centric city.

Effect on city logistics

While the focus on urban mobility often centres around the movement of people, the movement of goods and city logistics is an equally critical piece of the urban puzzle. City logistics has become a vital area of urban freight development, playing a significant role in how efficiently and sustainably a city functions. In car-centric cities, the increasing number of trucks and delivery services worsens the congestion and deteriorates the environment⁴. People-centric city designs, on the other hand, present a different scenario. These designs can include dedicated delivery zones, optimised freight traffic routes, and incentives to use smaller, more environmentally friendly vehicles. This approach reduces congestion and contributes to a more sustainable logistic framework.

However, transitioning to greener logistic solutions is not without its challenges. The complexity of urban infrastructure, particularly in historic areas with narrow streets not designed for modern freight traffic, poses significant hurdles. Large, heavy vehicles struggle to navigate these tight spaces, creating bottlenecks and safety issues.

Conclusions on city design

Regardless of the choices made in any country or city, they are not irreversible. History has shown us that the evolution of the city infrastructure can happen both ways - previously green and very liveable cities were turned car-centric and vice versa⁵. For Slovak cities, the lessons (both good and bad) from these global models can be invaluable. The challenge now is deciding what kind of urban environments we want for future generations: built around cars or people.

FROM TRACKS TO APPS: THE FASCINATING EVOLUTION OF URBAN MOBILITY IN SLOVAKIA

Let's discover a story of how urban mobility in Slovakia evolved over the last century.

Timeline⁶

1895 – Prešporok (Bratislava today) introduced a city tram railway as the first city in central Europe.



(Celebratory presentation of the first Bratislava trams -Source: <https://imhd.sk/ba/media/gn/00021794>)

1898 - Regular transport via omnibuses ended.

1899 – Bratislava introduced its **first night tram lines**.

1904 - The **first ever trolleybus service in the entire Austro-Hungarian Empire** was introduced connecting destinations Poprad and Starý Smokovec⁷.

1909 - **First trolleybus track** introduced in **Pressburg (Bratislava today)**.

1911 - **New direct trains for factory workers were established,**

1914 - **The new track Electric local railway Bratislava – Vienna was opened.**

1976 - A new underpass was built at a large traffic intersection it was supposed to serve as a transfer station for the Bratislava Metro (which remains projected, but not executed)⁸.

1990s are marked in the spirit of a general decline in public transport in Bratislava.

2016 brought back buses with bicycle trailers after a couple of years⁹.



(Source: <https://imhd.sk/ba/media/gn/00023302>)



(Picture of the Viennese tram in front of the Carlton hotel. Source: <https://imhd.sk/ba/media/gn/00005979>)

NAVIGATING THE BUMPS AND DETOURS: URBAN MOBILITY BARRIERS AND CHALLENGES

The complex landscape of urban mobility holds many bumps and detours - both literally and figuratively. While we leave the actual potholes aside, discussing more strategic barriers and challenges that main mobility stakeholders face is crucial. We will analyse them more deeply as part of these overarching themes:

1. Congestion and Infrastructure Limitations
2. Environmental Concerns and Sustainability
3. Equity and Accessibility
4. Technological Integration and Innovation
5. Technological Adoption
6. Economic and Financial Constraints
7. Policy, Regulation, and Governance
8. COVID-19 pandemic

These themes will allow us to take a closer look at why it can be difficult to switch gears to a more efficient, smart and sustainable urban mobility - a transition that, as we will see, is not always a smooth journey but one that is essential and attainable with the right approach.

1. Congestion and Infrastructure Limitations

The heartbeat of a city is traffic. The current state in Slovakia indicates a reasonable level of stability; nevertheless, emerging trends signal a worsening scenario, impacting efficiency, sustainability, and livability across cities. This challenge persists throughout Slovakia, with daily real-time reports on traffic jams, especially in large cities, as Bratislava⁴ and Košice⁵. In 2022, the largest cities Bratislava and Košice experienced substantial rush hour times (118 and 123 hours, respectively)⁶, signaling a need for transformative measures. "Transport is a big challenge in Bratislava. Košice, in comparison, has the advantage of having ring roads and traffic that is not so intensive." said Michal Hladký, director of Creative Industry Košice⁷.

⁴ <https://www.bratislavak.sk/dopravny-servis>

⁵ <https://www.radiokosice.sk/dopravny-servis>

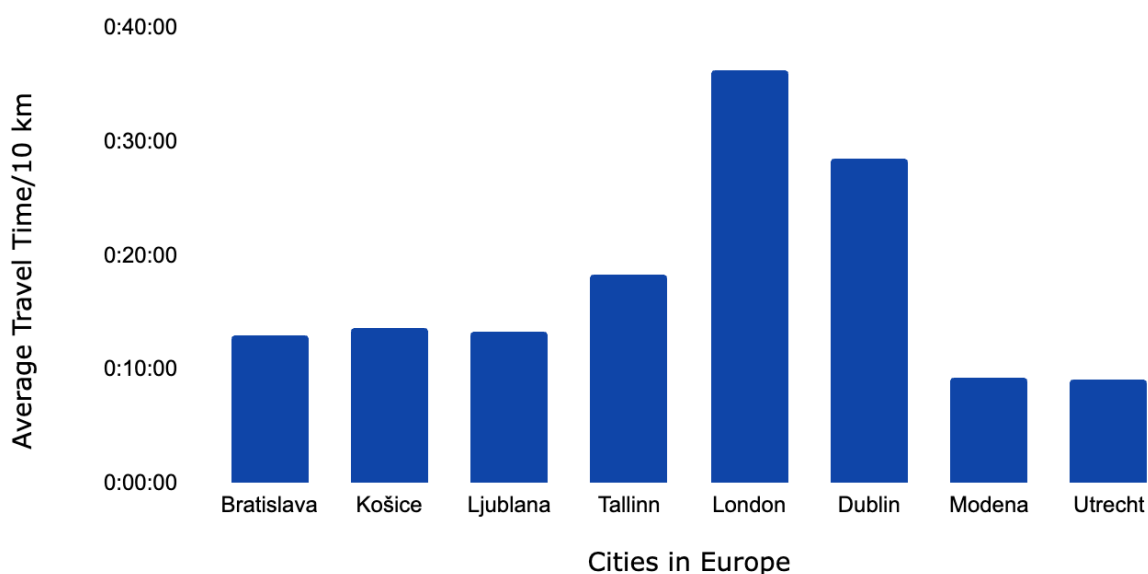
⁶ <https://www.tomtom.com/traffic-index/ranking/?country=SK>

⁷ <https://spectator.sme.sk/c/22289761/the-european-capital-of-culture-title-gave-kosice-the-courage-to-think-big.html#:~:text=When%20Ko%C5%A1ice%20was%20chosen%20to,to%20make%20a%20global%20impact.>

Regardless of the challenge, Slovakia maintains a favourable ranking in the Tom Tom’s Traffic Index⁸ compared to cities of similar size, but even on a broader scale in Europe. Last year’s data positioned Bratislava and Košice favorably, holding solid rankings of 256 and 220 out of 390 cities, respectively, and offer better traffic scenarios than Nice, city with a comparable population (with registered 165 hours in rush hour). See *Appendix 1* for more information on cities with comparable populations and the times spent in rush hour for 2022.

Relative to other well-known cities, Bratislava and Košice have ranked in the top third of the 390 analysed countries for the Tom Tom’s Traffic Index. See the following table for Ljubljana and Tallinn, as cities with comparable population, and London, Dublin, Modena and Utrecht as the top two worst and two best cities for average travel time per 10 kilometers with their respective ranking in the Tom Tom’s Traffic Index:

Average travel time per 10 km (minutes and seconds)



Trends and factors impacting traffic congestion in Slovakia:

First, the **increasing number of cars**. The number of registered vehicles in Slovakia has risen by approximately 1 million from 2010 to 2020 with an average year-on-year growth of about 100,000 vehicles⁹. The growth of vehicles for this period is twice as large compared to Bulgaria, a country with

⁸ The Tom Tom Traffic Index covers 390 cities across 56 countries and 6 continents. The index measures cities around the world by their travel time, fuel costs and CO2 emissions.

⁹ <https://www.ceicdata.com/en/indicator/slovakia/number-of-registered-vehicles>

a similar population to Slovakia¹⁰. “It is shocking, the number of cars is larger (or coming close to be) than the number of residents” said Petra Dzurovčinová, the Chief Innovation Officer of Bratislava.

Second, the **increased traffic intensity**. Emerging from the national traffic count conducted during the past two years, there has been an average traffic intensity increase of over 14% compared to the 2015 numbers¹¹, necessitating for urgent infrastructure completion. The Slovak Ministry of Transport emphasises the urgent need for the completion of the D1 highway in cities like Ružomberok, Žilina, and D3 in Kysucké Nové Mesto, specifying the critical impact of very high traffic intensities in these areas¹².

Third, **the poor road quality**. According to the World Economic Forum research, the quality of road infrastructure Slovakia falls far behind top-ranking countries (top five: Singapore, Netherlands, Switzerland, Hong Kong, Japan), positioned at 72 out of 141 countries globally¹³. In comparison, the neighboring countries Czech Republic and Ukraine share similarly low rankings (76 and 119, respectively). Meanwhile, Hungary and Poland show slightly better scores (69 and 57), and Austria excels, securing an impressive rank of 6. The need for transformative improvements in Slovakia's transport infrastructure becomes evident in this comparison¹⁴.

According to experts, the main reason behind the poor quality of roads is not lack of funds¹⁵, because when we look at other countries in the region, Slovakia does not significantly fall behind. The total investment in all modes of inland transport infrastructure was 1.05 billion EUR in 2018¹⁶, whereas Austria's total investment was 2.15 billion EUR in 2018¹⁷, Czech Republic's total investment was 1.79 billion EUR¹⁸, and Hungary's total investment was 2.58 billion EUR¹⁹. Experts see the main reasons for poor road quality in low investments into transport infrastructure and its poor maintenance and a lack of qualified experts²⁰.

¹⁰ <https://www.ceicdata.com/en/indicator/bulgaria/number-of-registered-vehicles>

¹¹ <https://www.cas.sk/clanok/2867153/viete-o-najvytazenejsom-dopravnom-useku-na-slovensku-denne-nim-prejde-neuveritelne-mnozstvo-aut/>

¹² <https://www.cas.sk/clanok/2867153/viete-o-najvytazenejsom-dopravnom-useku-na-slovensku-denne-nim-prejde-neuveritelne-mnozstvo-aut/>

¹³ https://www.theglobaleconomy.com/rankings/roads_quality/

¹⁴ <https://www.aktuality.sk/clanok/599492/kvalita-nasich-ciest-je-zalostna-zaostavame-aj-za-africkymi-krajunami/>

¹⁵ <https://www.aktuality.sk/clanok/599492/kvalita-nasich-ciest-je-zalostna-zaostavame-aj-za-africkymi-krajunami/>

¹⁶ <https://www.statista.com/statistics/439220/total-investment-in-inland-transport-infrastructure-in-slovakia/>

¹⁷ <https://www.statista.com/statistics/439074/total-investment-in-inland-transport-infrastructure-in-austria/>

¹⁸ <https://www.statista.com/statistics/439096/total-investment-in-inland-transport-infrastructure-in-czech-republic/>

¹⁹ <https://www.statista.com/statistics/439129/total-investment-in-inland-transport-infrastructure-in-hungary/>

²⁰ <https://www.aktuality.sk/clanok/599492/kvalita-nasich-ciest-je-zalostna-zaostavame-aj-za-africkymi-krajunami/>

Fourth, **design of infrastructure for an era with few vehicles in the streets.** Many cities, especially older urban areas, lack adequate road networks for heavy traffic and suffer from a deficiency in traffic infrastructure, bypasses in particular. In turn, this intensifies congestion, endangering safety on city roads, making cycling nearly impossible, and worsens the conditions for walking²¹. Moreover, limited and fragmented cycling infrastructure is prevalent at a city-wide level, with numerous Slovak cities completely devoid of cycling infrastructure²².

Fifth, **economic and commuting impact.** Congestion has additional economic effects for businesses. Delays in services and goods delivery impact overall productivity. Long commute times contribute to decreased satisfaction with urban living since, more often than not, commuting time directly affects the amount of personal or leisure time every day - quite a steep cost to pay.

Way to address the challenge:

- A. Innovative Traffic Solutions:** Intelligent traffic systems, real-time data processing, and other smart technologies implementation, which could support the cities, optimise traffic flow and improve the efficiency of existing transport infrastructure. According to Petra Dzurovčinová, Chief Innovation Officer of the City of Bratislava, the city needs to work closely with and provide the infrastructure for new innovations to come on board. Additionally, Petra emphasised, “the city is there to set the table and that this is not just for urban mobility but for innovation in general. This means to make policies so it's clear and equal for everyone”. She raises the importance of the city being for people, not for cars.

- B. Cycling infrastructure development:** Inadequate bicycle infrastructure spreads across the entire Slovakia²³. For context, Bratislava’s 66.6 kilometers (km)²⁴ of cycling paths, fall behind even smaller cities as Brno (136 km²⁵), and notably low compared to the neighbour capital Vienna (1,654 km²⁶). Many cities and municipalities in Slovakia have only very limited or non-

²¹ <https://blog.sme.sk/martinpekar/politika/plan-pre-buducnost-cestnej-dopravy-slovenska-priority-a-podpora>

²² <https://blog.sme.sk/martinpekar/politika/plan-pre-buducnost-cestnej-dopravy-slovenska-priority-a-podpora>

²³ https://cdn.climatepolicyradar.org/navigator/SVK/2013/national-strategy-of-development-of-cycling-transport-and-cycle-touring-in-the-slovak-republic_ehead60b5522dd18d1d88db561ba4354.pdf

²⁴ <https://www.bratislavskenoviny.sk/samosprava/75973-cyklotrasy-v-cislach-tipnite-si-kolko-km-pre-cyklistov-pribudlo-a-kadial-jazdia-najviac>

²⁵ <https://storymaps.arcgis.com/stories/fbc534a7a443491888d4476c2d4dcbf1>

²⁶ <https://www.wien.gv.at/english/transportation-urbanplanning/cycling/cycle-network.html#:~:text=The%20Vienna%20cycle%20network%20comprises,%2C%20and%20traffic%2Dcalmed%20zones.>

existent cycling infrastructure²⁷. Consequently, cyclists need to use roads and streets designated for automobile transport. Deteriorating pavement conditions, parking interventions of cycling paths, and overall cycling discomfort ultimately discourage people from using bicycles in their daily commutes. In order to promote cycling, the priority in Slovakia must be creating more new and safe bike lanes, this initiative will more likely reduce traffic than expanding car lanes.

- C. Promoting alternative modes of mobility:** Despite the development of new modes of transport in many cities, Slovakia must do more to support alternative modes of mobility, as it had the lowest share of fully electric cars among newly registered (2%), same as the Czech Republic, similar to Poland (3%), Hungary (4%), but notably behind Austria (16%)²⁸. Inadequate support for public transport, cycling, and pedestrian-friendly paths can reinforce the notion that cars are the only viable urban mobility option.

In order to promote alternative modes of mobility, more attention should be paid to **holistic planning in infrastructure** - prioritising user experience, comfort and safety in public transportation and active mobility options. This will likely aid in individual as well as cultural mindset switch about the importance of owning a personal vehicle to travel to work, school, or running other daily errands.

2. Environmental Concerns and Sustainability

Environmental concerns and sustainability encompass various factors, from air and water quality, to waste management, and greenery preservation. Air quality is key for achieving ecologically sustainable development and plays a fundamental role in human health²⁹. The report focuses on urban mobility, and this section will focus on its impact on air quality and noise pollution. Although the air quality and noise pollution levels are relatively good compared to other neighbouring countries, improvement is vital for Slovakia to align with the best ranked countries. Bratislava excels in green spaces, ranked third globally in the Green Cities Index (2018), behind Amsterdam (1st) and Auckland (2nd), and outperforming Göteborg (4th) and Sydney (5th)³⁰.

²⁷ https://www.matec-conferences.org/articles/mateconf/pdf/2017/48/mateconf_logi2017_00042.pdf

²⁸ <https://www.euronews.com/green/2023/05/08/norway-germany-uk-which-european-countries-have-the-biggest-share-of-electric-cars>

²⁹ <https://www.ces.vic.gov.au/news/air-quality-most-important-environmental-indicator>

³⁰ <https://bratislava.sme.sk/c/20811723/bratislava-je-na-tretom-mieste-v-rebricku-mnozstva-zelene-v-meste.html>

Air Quality. Vehicle emissions are a major contributor to poor air quality in cities, increasing health problems such as asthma, bronchitis, and other respiratory issues³¹. Slovakia ranks 71st globally (out of 131) in air pollution for 2022, according to the Air Quality Index (AQI) Ranking (Czech Republic 75th, Hungary 80th, Austria 90th)³². Despite the moderate level of air quality per World Health Organisation standards, Chad has three times worse AQI ranking compared to Slovakia, suggesting that the levels do not pose significant risks for the general population, however the air quality should be addressed³³.

The Slovak Environmental Inspection (SIŽP) identifies traffic as the main source of air pollution in Bratislava³⁴. However, poor air quality is multifactorial, including various sectors in Slovakia, i.e. power generation, food processing, manufacturing industry³⁵, and residential heating³⁶. Greenhouse gas emissions from road transportation tripled since the 1990s, as shown by data from the Slovak Hydrometeorological Institute, mainly from diesel cars and heavy goods vehicles³⁷, the only sector whose emissions are consistently on the rise³⁸. Moreover, transportation remains as the primary source of nitrogen oxide emissions, which contribute to health issues and environmental damage, including respiratory problems, acid rain, and urban smog³⁹. Another factor influencing the air quality is the idle time of cars. Data from Bolt⁴⁰ indicate that most cars are idle for about 95% of the time. Despite such a high percentage, cars are responsible for approximately 20% of total CO2 emissions.

The European Commission filed a complaint against Slovakia in 2021 for limit breaches, stressing the persistent problem⁴¹. Last year, Forbes reported increased values of dust particles in the Banská Bystrica and Košice regions since 2005, calling for attention to address this long-term issue⁴².

In general, the air pollution level in Slovakia is moderate⁴³. The worst state of air pollution level is in the Banská Bystrica self-governing region and the best air pollution level is in Prešov self-governing region.

³¹ <https://www.ucsusa.org/resources/vehicles-air-pollution-human-health>

³² <https://www.iqair.com/slovakia>

³³ <https://www.iqair.com/slovakia>

³⁴ <https://www.startitup.sk/bratislava-pripravuje-velke-zmeny-v-doprave-chce-nimi-zabranit-znecistovaniu-ovzdušia/>

³⁵ <https://www.iqair.com/slovakia>

³⁶ <https://oeab.shmu.sk/app/cmsFile.php?disposition=i&ID=207%27,%20%27%27>

³⁷ <https://www.euractiv.com/section/politics/news/road-transport-emissions-rising-in-car-friendly-slovakia/>

³⁸ <https://www.euractiv.com/section/politics/news/road-transport-emissions-rising-in-car-friendly-slovakia/>

³⁹ <https://www.euractiv.com/section/politics/news/road-transport-emissions-rising-in-car-friendly-slovakia/>

⁴⁰ <https://www.startitup.sk/bolt-ziskal-investiciu-vo-vyske-100-milionov-eur-pouzije-ju-na-skvely-ucel/>

⁴¹ <https://www.forbes.sk/viete-co-dychate-cisty-vzduch-by-sme-nemali-brat-ako-samozrejmost/>

⁴² <https://www.forbes.sk/viete-co-dychate-cisty-vzduch-by-sme-nemali-brat-ako-samozrejmost/>

⁴³ <https://www.aqi.in/dashboard/slovakia>

Interestingly, Bratislava region has the third worst air pollution level in the country and Košice region is the second best⁴⁴. City-wise, for example Košice is ranked cleaner than Bratislava in real-time AQI⁴⁵. The following table shows Real-time Air Quality Index using data from the Slovak hydrometeorological Institute, extracted on 11.12.2023:

THE 5 MOST POLLUTED CITIES	THE 5 LEAST POLLUTED CITIES
1. Prievidza, Slovakia - AQI: 105	6. Kežmarok, Slovakia - AQI: 17
2. Pezinok, Slovakia - AQI: 91	7. Turzovka, Slovakia - AQI: 20
3. Revúca, Slovakia - AQI: 89	8. Krásno Nad Kysucou, Slovakia - AQI: 21
4. Liptovský Mikuláš, Slovakia - AQI: 87	9. Medzilaborce, Slovakia - AQI: 29
5. Hnúšťa, Slovakia - AQI: 82	10. Poprad, Slovakia - AQI: 32

Noise Pollution. Traffic significantly contributes to noise pollution in urban areas, affecting the quality of life and potentially causing health issues, stress and sleep disturbances. While Slovakia reports a relatively favorable exposure of 9.6% of the population exposed to road traffic noise, compared to other European Union (EU) countries like the Netherlands (20.3%) and Switzerland (35.7%), Czech Republic (23.6%), Hungary (18.2%), Austria (32.4%), and Poland (17.3%), with notably higher percentages, addressing noise pollution remains important to enhance the overall well-being in Slovakia. Moreover, this aligns with Europe’s Zero pollution Action plan, covering noise pollution as one of the ambitions⁴⁶. Mitigating the impact of noise on the daily life of citizens will contribute to a healthier and more comfortable environment for living.

Ways to address the challenge:

A. Municipal initiatives

Addressing air pollution in cities demands a multifaceted approach, involving effective transport measures, increased effectiveness of air quality monitoring, green area creation, and air dust reduction efforts, as stated by Dagmar Schmucková, the spokesperson for the city Bratislava⁴⁷. Already implemented measures, such as the 10,000 trees project, new greenery planting, and creating

⁴⁴ <https://www.aqi.in/dashboard/sloviadi>

⁴⁵ <https://www.iqair.com/slovakia>

⁴⁶ <https://www.eea.europa.eu/publications/zero-pollution/health/noise-pollution>

⁴⁷ <https://www.startitup.sk/bratislava-pripravuje-velke-zmeny-v-doprave-chce-nimi-zabranit-znecistovaniu-ovzdušia/>

dedicated lanes for public transport and cycle paths⁴⁸, highlight the need for smart sustainable mobility solutions. The Mayor of Bratislava, Matúš Vallo, consistently emphasises the pivotal role of green areas in urban areas. On his Facebook page, Vallo highlights the profound impact of trees: “Even in today’s complicated situation, it is important to realise what a large significance trees have for our city. In summer, trees and shrubs protect our city from overheating, they improve the air quality, mitigate the effects of torrential rains, and provide shelter for animals and crucial insects”⁴⁹.

B. Use of public transportation (hydrogen, hybrid, and electric buses)

Bratislava took a notable step towards and eco-friendly transportation, by introducing four hydrogen buses on August 1st, 2023⁵⁰, with plans for an additional 36 vehicles to join the fleet. Slovakia already benefits from the use of electric buses. The first electric buses in Bratislava started operating in 2018, following Košice, which implemented them in 2014⁵¹.

C. Limits on the use of polluting vehicles in city centres

Several cities worldwide have implemented a car-free city center restriction to address environmental concerns and promote sustainability. One of the leading examples include Milan or Stockholm. While Milan plans a complete ban on cars in the city center by 2024⁵², Stockholm aims to set up a low-emission zone in the city center banning all petrol and diesel cars by 31 December 2024⁵³. These initiatives demonstrate an effort to address the city air pollution and broader environmental challenges.

Rastislav Cenký, director-general of the Transport Strategy Section of the Transport Ministry, emphasises that the “optimisation of public transport, connection continuity and quality information can address the challenges that affect us”⁵⁴. Embracing smart mobility not only improves city life but also aligns with the broader goals of economic, social, environmental, and cultural well-being. Moreover, for Slovakia to meet EU’s ambitious target of a 55% reduction in net greenhouse gas emissions by 2030 (1990 as base year)⁵⁵, sustained and effective measures are imperative.

⁴⁸ <https://www.startitup.sk/bratislava-pripravuje-velke-zmeny-v-doprave-chce-nimi-zabranit-znecistovaniu-ovzdušia/>

⁴⁹ <https://www.facebook.com/vallo.primator/photos/www10tisticstromovsk-aj-v-dne%C5%A1nej-zlo%C5%BEitej-situ%C3%A1cii-je-d%C3%B4le%C5%BEit%C3%A9-ovedomi%C5%A5-si-ak%C3%BD-v/1673505172807475/>

⁵⁰ <https://www.plasticportal.eu/en/hydrogen-buses-run-on-hydrogen-from-slovnaft-on-bratislavas-roads/c/8710/>

⁵¹ <https://www.e-car.sk/elektricke-autobusy-najdeme-aj-v-slovenskych-mestach/>

⁵² <https://discerningcyclist.com/milan-car-ban/>

⁵³ <https://eurocities.eu/latest/stockholm-has-a-new-tough-plan-to-ban-polluting-vehicles/>

⁵⁴ <https://spectator.sme.sk/c/23190425/slovakia-urban-smart-mobility.html>

⁵⁵ https://climate.ec.europa.eu/eu-action/european-climate-law_en#:~:text=The%20European%20Climate%20Law%20writes,2030%2C%20compared%20to%201990%20levels.

3. **Equity and Accessibility**

During this year's Smart City conference (Sme Konferencie), Dominik Janík, CEO of Citya, pointed out a pressing issue: 3.4 million people in Slovakia have poor access to public transport, especially outside of city centres⁵⁶. This lack of accessibility challenge translates into **transport poverty**⁵⁷, a term denoting insufficient access to important services or work due to inadequate transport services or the inability to pay for these services⁵⁸. It has primarily been discussed at the EU level in the context of the 'fit for 55' package and the sustainable and smart mobility strategy, as it is intertwined with social vulnerabilities such as low income, old age, or disabilities, as well as regional disadvantages⁵⁹.

Defining factors affecting equity and accessibility:

First, no transport availability. The absence of transport options generates a vivid image of what is now referred to as mobility poverty. The unequal distribution of transport resources is a major source of concern, being either a lack of transport options or infrequent services. There is a long-term persisting noticeable disparity in the quality and availability of transport options across different areas in many cities⁶⁰. The weaker regions entail transport infrastructure of low quality with bad accessibility towards major cities, centers and other important transport routes, amplifying their detachment⁶¹. Affluent areas typically have better access to high-quality public transportation, safe cycling paths, and well-maintained roads, whereas underprivileged or underdeveloped areas may have insufficient services and longer wait times. Living in peripheral and remote areas outside of city bounds also increases the risk of transport poverty. TV Noviny, a Slovak web portal, reports that despite the rising trend in public transport usage, Slovakia continues to be behind countries such as Denmark, Netherlands, and Germany, in which over a half of the population relies on public transportation⁶².

Second, no accessibility to existing transport options. Vulnerable demographics, including the elderly, people with disabilities or impaired mobility, and parents with prams, trying to reach essential destinations, face particular challenges and essential public transport and infrastructure features such as low-floor buses, ramps, tactile pavements, and audible traffic signals are often lacking or poorly

⁵⁶ <https://spectator.sme.sk/c/23190425/slovakia-urban-smart-mobility.html>

⁵⁷ [https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA\(2022\)738181](https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA(2022)738181)

⁵⁸ [https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/738181/EPRS_ATA\(2022\)738181_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/738181/EPRS_ATA(2022)738181_EN.pdf)

⁵⁹ [https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/738181/EPRS_ATA\(2022\)738181_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/738181/EPRS_ATA(2022)738181_EN.pdf)

⁶⁰ http://www.humannageografia.sk/clanky/Hornak_2005c.pdf

⁶¹ http://www.humannageografia.sk/clanky/Hornak_2005c.pdf

⁶² <https://tvnoviny.sk/domace/clanok/850302-slovaci-vo-vacsich-mestach-prechadzaju-z-aut-do-mhd-v-mensich-je-to-vsak-naopak>

maintained. Several cities in Slovakia have begun to switch to low-barrier trams and buses. For example, all buses in Košice are barrier-free⁶³, and other Slovak cities should follow suit. Generally, public transport becomes an attractive choice if all age groups and persons with special needs are considered when selecting and upgrading current mobility offerings. Over 58% of the population in Slovakia endures poor access to public transport^{64,65}, facing long walks to a bus stop (about 20 minutes), or make at least two transfers to reach their destination, says Janík, CEO of Citya. Transport poverty was found to correlate with social vulnerabilities and affect women, the elderly, young people, the unemployed and the disabled more. Furthermore, the COVID-19 pandemic had a major effect on those living in transport poverty - fear of the virus, social distancing and other city or country-wide measures led to limited possibilities to use public transport and exacerbated the social and economic gap further.

Third, low affordability of transportation costs. For low-income people, the cost of urban transportation can be prohibitively expensive, limiting their mobility and, by extension, their access to essential services, employment opportunities, and social activities. Transport poverty can also refer to households that spend 10% or more of their budget on transportation, meaning they are very sensitive to any potential transportation price increase. The economic challenges in Slovakia, marked by the lowest net household earnings in the European Union in 2022⁶⁶, further exacerbate the situation. There have been significant rises in ticket costs (averaging 20%) for public transport recently (including the national rail carrier ZSSK), for the Bratislava region, justified by the mayor of Bratislava Vallo as essential to maintain the current extent and quality of transport services in the city. Tickets in Bratislava have grown to be more expensive by one fifth since 1st July this year⁶⁷. Additionally, new ticket prices also apply in suburban bus transport in the east of Slovakia as of February 1st, 2023. These further strains household budgets, especially provided that the number of the poor is growing in Slovakia⁶⁸.

⁶³ <https://www.dpmk.sk/cestovanie/bezbarierove-cestovanie>

⁶⁴ <https://spectator.sme.sk/c/23190425/slovakia-urban-smart-mobility.html>

⁶⁵ [https://www.worldometers.info/world-population/slovakia-population/#:~:text=Slovakia%202023%20population%20is%20estimated,312%20people%20per%20mi2\).](https://www.worldometers.info/world-population/slovakia-population/#:~:text=Slovakia%202023%20population%20is%20estimated,312%20people%20per%20mi2).)

⁶⁶ https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/komentare_2023/hlavac_2023_slovakia_convergence_eu_ppp.pdf

⁶⁷ <https://www.bratislavskenoviny.sk/samosprava/77059-chcete-aj-po-zdrazeni-mhd-cestovat-za-stare-ceny-mate-este-jednu-moznost>

⁶⁸ <https://enrsi.rtv.slovakia.sk/articles/topical-issue/341851/number-of-the-poor-in-slovakia-grows#:~:text=In%20the%20European%20Union%2C%20a,according%20to%20the%20Statistical%20Office.>

Fourth, long commute times. Many people commute daily from surrounding areas to urban centres for work or education. In Slovakia, this exacerbates the already heavy congestion during peak hours in the country's largest cities and significantly extends the commute time. This struggle, often called as 'time poverty' is vivid in Bratislava, with 150,000 people commuting daily for work⁶⁹, creating a situation with substantial traffic congestion spanning over kilometers, demanding one hour of daily sacrifice for travel⁷⁰. Košice, second largest city in Slovakia, echoes such situation, where commuters experience tens of minutes of standing car queues in their daily travel⁷¹.

Way to address the challenge:

In the context of the sustainable and smart mobility strategy⁷², which is part of the EU Green Deal⁷³, the European Commission issued a package of proposals to support a transition to cleaner, greener transport in 2021. The Commission's communication⁷⁴ on the new EU urban mobility framework greatly emphasises safe, inclusive and affordable public transport, which 'must be at the center of sustainable urban mobility planning, be available and attractive to all and offer barrier-free access', provided that transport is among the essential services within the European Pillar of Social Rights⁷⁵. According to Miloslav Janík, chair of the Smart Cities Club, improved urban mobility has the potential to not only improve the quality of life in cities but can also generate new revenue⁷⁶.

There are several ways how to increase accessibility of transportation in Slovakia:

First, people need to be offered alternative options to private car usage. Peter Mesarč of Bolt, emphasises that to properly convince people to drop privately owned cars, we need to be looking at two main areas: public transport and alternative means of transportation. For example the Smart Cities Club suggests the investment in operational public transport, such as "a minibus or a shared vehicle that stops at public transport stops and can be ordered via an app or a control system" meaning getting as many people into a vehicle as possible⁷⁷.

⁶⁹ <https://urbact.eu/articles/sdg-story-bratislava#:~:text=Bratislava%20is%20the%20capital%20as,are%20commuting%20daily%20for%20work.>

⁷⁰ <https://spojenaba.sk/kazdy-den-hodina-do-prace-ake-nevyhody-ma-byvanie-za-hranicami-bratislavy/>

⁷¹ <https://www.kosiceonline.sk/dopravny-kolaps-v-kosiciach-mesto-caka-na-obchvat>

⁷² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0789>

⁷³ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁷⁴ https://transport.ec.europa.eu/system/files/2021-12/com_2021_811_the-new-eu-urban-mobility.pdf

⁷⁵ https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-investment/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

⁷⁶ <https://spectator.sme.sk/c/23190425/slovakia-urban-smart-mobility.html>

⁷⁷ <https://spectator.sme.sk/c/23190425/slovakia-urban-smart-mobility.html>

Second, accessible buses for everyone increase the usage of public transportation by persons with mobility challenges. For instance, Bratislava bought new low-floor, high-capacity comfortable buses in 2021 and replaced a portion of the older fleet⁷⁸ improving access for disabled or physically impaired passengers.

And third, adopting and investing into smart city solutions, e.g. cameras, can enhance smart urban mobility through various applications such as:

- Traffic monitoring
- Traffic management
- Control of traffic rules
- Safety in public, including pedestrian and cyclist safety
- Management of parking
- Emergency response to real-time situations

4. Technological Innovation and Integration

Slovakia faces a continual challenge in the generation and support of innovation, evident in the lagging position among the 27 EU countries, obtaining the second lowest innovation score for 2022⁷⁹. This categorises Slovakia as a “emerging innovator”, according to the European Innovation Scoreboard, which signifies the highest need for innovation but experiencing the slowest growth⁸⁰. The State of European Tech 2023 report by Atomico, highlights Slovakia as one of the least entrepreneurial European countries for technology startups, ranked 28th (out of 31 assessed countries)⁸¹. With less than 50 startups per capita funded in 2023, Slovakia falls significantly behind Europe's leader Estonia with over 400 startups funded per capita and even coming last in the V4 cluster (Hungary (20th rank), Czech Republic (24th rank), and Poland (27th rank)). This emphasises a pressing need for a robust and comprehensive innovation ecosystem to push the nation forward.

Cities, municipalities, and startup support organisations in Slovakia are actively supporting the cause of innovation in urban mobility, placing efforts to work collaboratively in order to drive a (transformative) change in what is possible. In a call focusing on cities’ information technology ‘to improve security in the city, the quality of public transport, building management, the environment,

⁷⁸ <https://sita.sk/nasadoprava/bratislava-sa-rozluci-so-starymi-karosami-dopravny-podnik-nakupi-desiatky-novych-autobusov/>

⁷⁹ <https://kinit.sk/slovakia-needs-better-support-for-digitalization-and-innovations-of-smes/>

⁸⁰ <https://kinit.sk/slovakia-needs-better-support-for-digitalization-and-innovations-of-smes/>

⁸¹ <https://stateofeuropeantech.com/>

and communication with the citizens' published by the Ministry of Investments, Regional Development and Informatisation of the Slovak Republic, 22 largest cities (out of 39 examined) submitted a total of 381 projects, showing that there is an interest from cities to apply modern technologies⁸². Real-time data analytics, smart sensors and traffic management systems, autonomous vehicles, environmentally friendly energy sources for vehicles - all these solutions could bring groundbreaking change into how we and goods move around cities. However, integrating these technologies requires substantial investment in monetary and human resources, as well as upgrading and maintaining the infrastructure that also needs to catch up. Not to mention that all the different innovations and new technological developments need to be able to sync and work together seamlessly. Furthermore, commenting on how cities should support the transformation, Petra Dzrovčinová of the City of Bratislava highlights that the city needs to work closely and provide the infrastructure for new innovations to come on board. She views the city is there to set the table (for innovation in general) and make clear and equal policies for everyone.

Various stakeholders actively engage in generating and supporting innovation, demonstrating a keen interest to cultivate a culture of forward-thinking.

1. Cities and municipalities, playing a pivotal role, are interested and active. Following are noteworthy endeavors.

Bratislava Open Lab⁸³: an innovative technological centre for the development of young IT talents. Their aim is to improve the quality of opportunities for students in Slovakia⁸⁴. This centre supports the theme urban mobility by focusing on sustainable solutions, as for example parking sensors and air meter monitors development, among others.

Košice 2.0⁸⁵: an initiative aiming to establish a collaborative creative ecosystem, fostering cooperation among the municipalities, population, and the business community. The objective is to collectively make informed decisions and enhance the overall quality of life in the city⁸⁶.

2. Initiatives supporting innovation ecosystem, inclusive of startup support organisations.

⁸² <https://www.globesy.sk/wp-content/uploads/2023/04/21.-Sustainable-Transport-within-the-Context-of-Smart-cities-....-UNIZA-2022.pdf>

⁸³ <https://openlab.sk/>

⁸⁴ <https://www.startitup.sk/jedinecny-koncept-vzdelavania-openlab-predstavil-inovativne-technologicke-centrum-ktore-nakopne-mozno-aj-teba/>

⁸⁵ <https://kosice2.sk/>

⁸⁶ <https://www.cike.sk/project/urban-innovative-action/#:~:text=Projekt%20Ko%C5%A1ice%202.0%20je%20realizovan%C3%BD,be%C5%BEen%C3%BDch%20okolnos%C3%AD%20neboli%20schopn%C3%A9%20financova%C5%A5.>

Climathon has successfully run its 4th year in Bratislava. Climathon runs a series of challenges each year, targeting pressing issues. This year, the focus was on challenges which either indirectly or directly relate to sustainable urban mobility⁸⁷:

- Motivating and involving citizens in driving climate-neutral changes
- Enhance the Bratislava ID with sustainable development goals
- Inspiring, motivating, and supporting citizens in making environmentally conscious choices.
- Through digital integration establish a Bratislava Citizen Climate Board.

3. Actors and conferences, providing instances for establishing connections and collaboration.

Slovak Smart City Cluster⁸⁸ is an association integrating key stakeholders of the country (representatives of the business environment, public administration, academic environment and technological innovations). The cluster is interested to support the “development and propagation of Smart city concept and urban regions in Slovakia”⁸⁹, i.e. drive the use of innovations within cities and municipalities. This collective effort highlights the dynamic and collaborative spirit driving innovation across the Slovak landscape.

5. Technological Adoption

An effective adoption of new technologies is the life-root of innovation in urban mobility shaping the transformative advancements that can redefine the way you experience and navigate a city. The Organisation for Economic Co-operation Development (OECD) clearly stated the vital importance for Slovakia to diversify its drivers of growth and enhance its innovation capacity and the adoption of new technologies⁹⁰. At present, there is a noticeable digital gap between Slovak companies and their correspondents in other OECD countries, particularly with smaller companies significantly falling behind larger companies⁹¹. Once new technological advances in urban mobility are developed and implemented, for them to be successful, they need to be used. Technological adoption is a challenge that both public and private actors face, and it ultimately decides the fate of the innovation.

Key factors influencing the technological adoption in sustainable urban mobility:

⁸⁷ <https://inovacie.bratislava.sk/en/climathon-en/>

⁸⁸ <https://smartcluster.sk/en/>

⁸⁹ <https://smartcluster.sk/en/>

⁹⁰ <https://www.oecd.org/economy/surveys/Slovak-Republic-2022-OECD-economic-survey-overview.pdf>

⁹¹ <https://www.oecd.org/economy/surveys/Slovak-Republic-2022-OECD-economic-survey-overview.pdf>

First, a very **prominent need to “own” a personal vehicle** still exists. This prevailing attachment is supported by the country’s highest year-on-year growth (5.4%) from 2019 to 2020, which is significantly higher than the EU average of 1.2%⁹². To overcome this habit a shift in mindset is essential, identified as a key challenge by the Chief Innovation Officer of Bratislava, Petra Dzrovčinová. According to Peter Mesarč, country manager of Bolt Slovakia, it is crucial to “establish a synergy between the public transport system and the private sector, and create a value proposition for people to convince them that they do not need a car or two per household.” Mesarč highlights this goal is achievable with the correct incentives, or punishments (taxes), to elevate intercity transport in Slovakia. Meanwhile some perceive personal cars as a daily necessity, others perceive them as a matter of comfort or habit. To encourage the latter group to adopt alternative transport modes demands different incentives, even innovative ones as changing daily habits is a challenging matter. This factor hinders quick adoption of innovative transportation methods.

Second, **public acceptance and usage of new technology poses a critical barrier**. E-scooter introduction in Bratislava led to challenges such as cluttered and obstructed sidewalks from scooters left randomly in public spaces. This prompted the collaboration of Bolt with the City of Bratislava to create designated parking areas to minimise the blockage of access to public spaces and buildings henceforth enhance overall user experience and liveability in the city for the citizens. Additionally, when Bolt first introduced scooters in Slovakia, many were stolen and vandalised⁹³. Similarly to Bratislava, this problem concerns other cities within Europe, such as Vilnius, Lithuania. When the first shared "orange bikes" were introduced in Vilnius (around 2001), 1000 bikes were stolen from the streets in just a few days. Vandalism and safety remain important factors for companies trying to build a sustainable business model for themselves and offer attractive alternative mobility modes for city inhabitants. Habits, particularly among older demographics, pose a barrier to adopt technology-driven ride-sharing apps, e-scooters, and autonomous vehicles. For some, reluctance of adoption is driven by uncertainties around privacy, safety and reliability. This dynamic highlights the potential to exacerbate the digital divide within the city and highlights the need for tailored efforts to bridge this gap as tech-savvy groups will quickly integrate new mobility options, whereas others will require considerable time, effort and will to leverage innovations effectively.

Ways to address the challenge:

⁹² <https://www.acea.auto/files/ACEA-report-vehicles-in-use-europe-2022.pdf>

⁹³ <https://www.startitup.sk/boltaci-nechcu-povedat-kolko-kolobeziok-ludia-znicili-a-pokradli-pracuju-na-novom-systeme-parkovania/>

- A. **Inclusive Technological Transformation.** Only through inclusive progress can we truly transform urban mobility landscapes, making them more technologically advanced, connected, and equitable for all. As urban mobility evolves, it is critical to address these concerns and ensure that transportation advancements are inclusive and accessible and meet the diverse needs of all city residents.

- B. **Effective Communication and Support for Technological Adoption.** Clear and explicit communication of the new technology and why it should be adopted. Additionally, it is essential to offer educational support and enough support opportunities for the citizens who might struggle with the change and give enough time for them to adjust, which does not form a feeling of reluctance or fear. This might improve the percentage and ease of adoption of new technology in Slovakia.

- C. **Synergy between many modes of transportation.** “Only when the public transport will offer great synergy and a very attractive and affordable offer towards citizens then the trend to convince people to drop off the car is rapidly increasing” said Peter Mesarč from Bolt. He further adds that “Key is to create a synergy between the public transport system and the private sector, create a good offer and Value Proposition for people to convince them that they do not need a car or two cars per household.”

6. Economic and Financial Constraints

Slovakia deals with a severe economic deficit transiting on cities country-wide, a serious challenge underlined by its status as the second-lowest gross domestic product (GDP) per capita EU member⁹⁴. Slovakia faces an enormous investment debt of at least 40 billion EUR, evident in the railway, road, and public infrastructure condition, being unsurprising as Slovakia invests the least out of the Visegrad Four (V4) countries (the Czech Republic, Poland and Hungary) and likewise fails to invest into national priorities⁹⁵.

This economic challenge has a spill-over effect on cities in Slovakia, with Bratislava being the second poorest capital city in Europe⁹⁶. “Development aside, it will be about survival” points out mayor Vallo,

⁹⁴ <https://spectator.sme.sk/c/23234427/eurostat-data-fix-slovak-experts.html>

⁹⁵ [https://newsnow.tasr.sk/vasakova-slovakia-stagnating-partly-due-to-eu40-billion-investment-debt/#:~:text=%22We%20have%20a%20huge%20investment,Republic%2C%20Poland%20and%20Hungary\)%20.](https://newsnow.tasr.sk/vasakova-slovakia-stagnating-partly-due-to-eu40-billion-investment-debt/#:~:text=%22We%20have%20a%20huge%20investment,Republic%2C%20Poland%20and%20Hungary)%20.)

⁹⁶ <https://www.trend.sk/spravy/vallo-danovy-bonus-znizi-prijmy-bratislavy-26-milionov-eur>

emphasising pressing need to address the enormous revenue shortfalls resulting from legislative changes on the national level⁹⁷. This suggests a retractive investment atmosphere. Additionally, with limited budgets, cities often struggle to find the balance between investing in necessary improvements, maintaining current infrastructure, and ensuring affordability for all its residents.

The mayors from various cities and municipalities have plans to invest into advancements of urban mobility, however, the budget constraints are limiting their capacity to undertake these initiatives.

Way to address the challenge:

A potential strategy to navigate the challenges posed by the national debt is the “lean approach”, specifically in the meaning to pilot a strategy in a smaller, monitorable and manageable level and only then scaling it if the pilot proves successful. This enables a controllable and measurable approach allowing for the efficient allocation of resources, identification of successful models, and mitigation of potential risks. It promotes an adaptable strategy easily to be fine-tuned based on the outcomes. Petra Dzurovčinová highlights such approach with a city lab, a framework for testing and piloting new innovation in the city environment, where the city ran several pilots on sensory networks and cameras counting pedestrians or cyclists.

An interesting success story of this approach is the story behind MaaS Global, the world’s first Mobility-as-a-Service provider, where the nation, Finland, served as an incubator to make the idea successfully come to life⁹⁸. It served as a perfect laboratory to test this innovation given that Finland had no passenger car industry of its own⁹⁹.

For the success of smart city initiatives in Slovakia, a strategic shift and increased proper allocation of resources to national priorities, including technology and infrastructure development, may be crucial. The decline in the inflow of investments has potentially impacted, or at least contributed to, the overall development of smart city solutions. New innovative infrastructure, such as involving smart sensors for better journey planning, congestion spotting and, if needed, rerouting of passengers and goods, requires its own set of investments, which also need to be secured in already limited public expenditure budgets. Therefore, it is a balancing act - choosing which infrastructure and when to upgrade, planning

⁹⁷ <https://spravy.pravda.sk/regiony/clanok/652395-rozvoj-bokom-pojde-o-prezitie-bratislava-ocakava-obrovske-vypadky-prijmov/>

⁹⁸ <https://whimapp.com/helsinki/en/history-of-maas-global/>

⁹⁹ https://whimapp.com/wp-content/uploads/2022/01/MaaSGlobal_History.pdf

how the new upgrades fit into the existing processes and systems, and keeping a close eye on which other actors or users are affected and how greatly.

7. Policy, Regulation, and Governance

The vibrant urban mobility future faces a challenge in the form of an absence of a clear vision cultivated in a participative setting. Nevertheless, a promising solution is in the local approach and regulations by cities and municipalities for different types of ride-sharing, which have the potential to stimulate the adoption of innovative urban mobility solutions and alternative modes of transport.

Recognising the current standing and challenges Slovakia faces in urban mobility, it becomes crucial to embrace effective and active governance. It is vital to implement and enforce new policies and regulations and coordinate among different actors, such as governmental agencies, businesses, NGOs, lobby and citizen groups, media representatives and others, to ensure comprehensive and cohesive strategies and their proper dissemination. It is also important to ensure that government structures are inclusive and encourage active participation in all policy and regulation creation and management stages. This collaborative policy-making approach and regular communication and consultations with a wide range of urban stakeholders, such as transportation providers, businesses, residents, city infrastructure and maintenance representatives, can ensure that all sides are heard, and their inputs, experience and expertise are taken into account before making major decisions and investments.

Following are examples how the city can influence alternative mode of transportation:

First, **bike and e-scooter sharing**.

While the number of shared e-scooters is growing in Slovakia¹⁰⁰, Paris is clearing its streets with a ban (first European country to do so)¹⁰¹. Nevertheless e-scooter sharing companies operating in Slovakia do not fear other countries to follow such a decision¹⁰², and cities in Slovakia where the service is operational reportedly do not feel pressured to discontinue shared e-scooters, even in the most frequent complaints about safety¹⁰³. Mayor of Bratislava Vallo emphasises the essential benefits of e-

¹⁰⁰ <https://spravy.pravda.sk/regiony/clanok/662747-parizania-zakazali-kolobezky-na-slovensku-to-ludia-neziadaju-ani-po-nehodach/>

¹⁰¹ <https://www.theguardian.com/world/2023/aug/31/rented-e-scooters-cleared-from-paris-streets-on-eve-of-ban>

¹⁰² <https://www.aktuality.sk/clanok/u91I5Lj/zakazu-kolobezky-v-uliciach-na-slovensku-sa-rozbieha-peticia-po-vzore-pariza/>

¹⁰³ <https://spravy.pravda.sk/regiony/clanok/662747-parizania-zakazali-kolobezky-na-slovensku-to-ludia-neziadaju-ani-po-nehodach/>

scooters “they bring a relief to not only the environmental area, but also in the area of transport alleviating congestion and freeing”¹⁰⁴, and according to the city spokeswoman Dagmar Schmucková, Bratislava entails one of the most strict regulations for shared mobility parking¹⁰⁵. Peter Mesarč, from Bolt, suggests a sustainable approach for intercity transport in Slovakia, combining two models from Belgium and Netherlands, emphasising that a short term car ban in a city is impractical, however investing in alternative transport infrastructure, such as bus and taxi lanes, potentially encourages people’s adaptation overtime. Bolt initiates this year’s new season only in five cities, including Bratislava Nitra, Trnava, Trenčín, and Piešťany, due to changes in Bolt’s strategy in Central Europe¹⁰⁶. This means operations are temporarily stopped in the cities Banská Bystrica, Bojnice, Galanta, Hlohovec, Holíč, Košice, Martin, Poprad, Prešov, Prievidza, Zvole and Žilina¹⁰⁷. However, e-scooters from the company Tier and Antik remain available in the whole of Slovakia.

Second, **car sharing**. In Slovakia, car-sharing is gaining popularity including¹⁰⁸ companies such as HoppyGo¹⁰⁹, SHARE CAR¹¹⁰, and others. This service enables users to rent a car for short periods, which in turn promotes a sustainable alternative to a traditional car. Just in the first year of its operation in 2021, the car sharing platform HoppyGo reached over 170 registered vehicle owners¹¹¹ and currently operates 2,500 cars¹¹² in Slovakia. This rising trend is supported by the fact that till the year 2035, it is expected that 7.5 million of vehicles in the EU will be shared¹¹³. However, this service is most popular in Germany in which nearly 16,000 cars are shared with around 1.26 registered users¹¹⁴. It is apparent that Slovakia falls behind, which indicates the need for further development and some type of support from municipalities, such as establishing a flexible parking policy in cities¹¹⁵.

¹⁰⁴ <https://www.aktuality.sk/clanok/u91I5Lj/zakazu-kolobezky-v-uliciach-na-slovensku-sa-rozbieha-peticia-po-vzore-pariza/>

¹⁰⁵ <https://www.aktuality.sk/clanok/u91I5Lj/zakazu-kolobezky-v-uliciach-na-slovensku-sa-rozbieha-peticia-po-vzore-pariza/>

¹⁰⁶

¹⁰⁷ <https://news.refresher.sk/135018-Oblubene-Bolt-kolobezky-uz-v-tychto-mestach-na-Slovensku-neuvidis-Spolocnost-sa-rozhodla-pokracovat-len-v-piatich-mestach>

¹⁰⁸ <https://www.startitup.sk/prenajatim-tvojho-auta-si-na-slovensku-zarobis-aj-2-000-eur-zaujeme-o-carsharing-neustale-rastie/>

¹⁰⁹ <https://hoppygo.com/sk>

¹¹⁰ <https://www.sharecar.sk/>

¹¹¹ <https://www.startitup.sk/prenajatim-tvojho-auta-si-na-slovensku-zarobis-aj-2-000-eur-zaujeme-o-carsharing-neustale-rastie/>

¹¹² <https://hoppygo.com/sk/about-us>

¹¹³ [https://mobiag.com/blog/ing-7-5-million-shared-cars-in-europe-by-2035/#:~:text=ING%20has%20published%20a%20new,0.1%25%20of%20all%20vehicles\).](https://mobiag.com/blog/ing-7-5-million-shared-cars-in-europe-by-2035/#:~:text=ING%20has%20published%20a%20new,0.1%25%20of%20all%20vehicles).)

¹¹⁴ <https://www.trend.sk/trend-archiv/car-sharing-preco-je-lidrom-nemecko-kde-je-bratislava>

¹¹⁵ <https://www.trend.sk/trend-archiv/car-sharing-preco-je-lidrom-nemecko-kde-je-bratislava>

8. COVID-19 effect on urban mobility

One of the most noticeable challenges in urban mobility worldwide observed in recent years, was the COVID-19 pandemic. It has been one of the most significant disruptors of urban mobility in Slovakia and required immediate action and changes from businesses, governments and citizens to develop new and adapted solutions. Public transportation experienced a major drop of 80% in usage, as a result of tough lockdowns during the pandemic in Slovakia, outlines Petra Dzurovčinová. The significant reduction in passengers also meant significant reduction in revenues generated from public transport fares for the transportation providers. The transport authority had a rough time dealing with missing money in their budgets, indicating dilemmas of resource allocation, further highlights Petra. In the year-on-year comparison from 2019 to 2020, revenue generated from public transport dropped by 30.47% in Žilina. In Bratislava, the COVID-19 pandemic caused a total loss in revenues of 25 million EUR¹¹⁶. Consequently, this financial strain on essential services caused fear and uncertainty not only for the travellers but also for the employees in the mobility sector.

Additionally, despite the emptiness in the city, there was a spike in cycling and a notable drop in car traffic, as most people worked from home. From the results of the study “the trend of the development in road passenger transport and the COVID-19 pandemic”, it is apparent there are minimal differences between all regions in Slovakia except for Bratislava region, with notably lower year-on-year index changes since 2015, which could have been caused by the launch of the integrated transport system in the region (IDS BK)¹¹⁷. The arrival of the COVID-19 pandemic in 2020 is evident in numbers. The drop in the number of transported people moved at the level of -27% (Bratislava region) to an astonishing -58% (Prešov kraj)¹¹⁸.

The implications of this drop were deep, triggering a notable shift in consumer behaviour. Food delivery and courier services became a noticeable rising trend during the pandemic, reflecting this shift. Restaurants reported increasing demand for orders at the same time as the number of customers dining directly in decreased, notes the senior personal relations manager of the online food delivery portal Bistro.sk Peter Porubský¹¹⁹. Delivery services in general gained a rapid rise in popularity during

¹¹⁶ <https://spectator.sme.sk/c/22649971/covid-slashed-passenger-numbers-on-public-transport-in-bratislava-by-two-thirds.html>

¹¹⁷ <https://www.svetdopravy.sk/trend-vyvoja-v-cestnej-osobnej-doprave-a-pandemia-covid-19/>

¹¹⁸ <https://www.svetdopravy.sk/trend-vyvoja-v-cestnej-osobnej-doprave-a-pandemia-covid-19/>

¹¹⁹ <https://www.forbes.sk/objednavate-si-domov-jedlo-v-case-koronavirusu-namiesto-hotovosti-pouzite-kartu-radi-epidemiolog/>

the pandemic¹²⁰, portraying the pandemic acting as the catalyst for this shift in behaviour. These services offer safety (in hygiene matters) and convenience that seems to be something we have gotten used to in our daily habits. The pandemic also highlighted the importance of technology in urban mobility. During the pandemic in general, contactless payments increased globally due to the emphasis on touchless transactions for hygiene and safety reasons¹²¹. For Slovakia, the payment behaviour radically changed, with double the number of non-cash payments made at points-of-sale terminals and a 100% increase in mobile payments in 2021.

While the pandemic seems to have accelerated the implementation and uptake of new trends, especially in active mobility, public transport systems are still recovering. Looking beyond the global health crisis and all the societal and economic challenges it brought, it is important to note that it also presented an opportunity to rethink and reshape urban mobility to ensure it can withstand future major disruptions and integrate health and wellbeing considerations into all steps of urban mobility planning.

¹²⁰ <https://hnonline.sk/style/gastro/2150822-nakupoval-vlastnu-pizzu-a-zarobil-vyuzil-chybu-donaskovej-sluzby>

¹²¹ <https://www.forbes.com/sites/forbestechcouncil/2021/04/15/how-the-pandemic-made-contactless-payments-the-new-normal/>

GRIDS AND GREENWAYS: TRENDS THAT SHAPE MOBILITY IN SLOVAKIA

As we navigate the labyrinth of urban mobility challenges and barriers, it becomes clear that innovative solutions and approaches are more than just desirable - they are essential to improve not just the movement of people or goods around the city, but to improve the overall quality of life of citizens and businesses. The one benefit of these challenges being shared across the globe is that they enable cities everywhere to learn from one another's experiences and find effective, proven solutions to their own complex mobility scenarios. Several emerging global trends shape the urban living areas in Slovakia and beyond. These global trends include:

1. Public space prioritisation
2. Intermodality
3. Active Mobility
4. Mobility-as-a-service (MaaS)
5. A shift to electric vehicles
6. Pollution reduction measures
7. Changes in city logistics and infrastructure
8. Smart and data-driven solutions

Discussing these trends will help us understand which direction current and future mobility innovations are taking us and how to best prepare for the inevitable changes, ensuring our cities stay safe, healthy and liveable for future generations.

1. Public space prioritisation

The development of pleasant and liveable urban spaces for the citizens lies at the centre of urban mobility interests. It is an area that people do not necessarily consider as one of the urban mobility topics, yet it is more relevant to the citizens than having a liveable urban space.

The focal point in Slovakia became the transformation of urban spaces, including the development of parks, green roofs, playgrounds for children and sports facilities. The mayor of Bratislava Matúš Vallo launched a programme called 'Living cities' (Živé mestá), making it a historic initiative with the priority of the capital city to enhance the quality of public spaces¹²². Vallo emphasises that "Bratislava has a

¹²² <https://www.yimba.sk/obnova-verejnych-priestranstiev/hlavne-mesto-priblizilo-zamery-v-oblasti-rozvoja-verejnych-priestranstiev>

huge debt in the modernisation and quality improvement of public spaces”, further supporting the need for modernisation of these areas. The program currently focuses to revitalise 25 public places and make them more pleasant and barrier-free environments, ranging from neglected parks and forgotten residual spaces, inner-blocks, town squares, and recreational locations¹²³. Renowned parks in Bratislava are already in the process of revitalisation, addressing the need for improved green spaces. Vallo further adds that although Bratislava is a very green city that does not fulfil its potential, as many locations are in a bad condition or completely not in use. The same notion echoes in the city Košice, where Tomáš Ctibor, who led a workshop on the future of the Office of the Chief Architect in Košice, emphasises that “People make the city, and public space has to be there for them”¹²⁴.

In Slovakia, this transformation can be seen not only in major cities but also in various regions as for example the following (among many others):

CITY	THE REVITALISATION OF PUBLIC SPACES SELECTED INITIATIVES
Malacky	Revitalisation of public spaces through the establishment of green infrastructure in the center of the city Malacky. The goal is to improve environmental aspects in cities and urban areas ¹²⁵ .
Trenčín	<p>Revitalisation of the public space projects include for example ‘Rozkvet’, Považska street. Moreover, in the Trenčín City Development Program 2016 – 2022¹²⁶ there is a priority for revitalisation of green public spaces at the waterfront.</p> <ol style="list-style-type: none"> <li data-bbox="527 1339 1456 1476">1. Rozkvet¹²⁷ - Revitalize urban elements and implement ecological principles to green the cultural and social open space, Rozkvet, for the achievement of the project goal.

¹²³ <https://www.yimba.sk/obnova-verejnych-priestranstiev/hlavne-mesto-priblizilo-zamery-v-oblasti-rozvoja-verejnych-priestranstiev>

¹²⁴ <https://www.yimba.sk/obnova-verejnych-priestranstiev/nova-podoba-znamych-parkov-bratislava-zlepsuje-zelene-priestory-rozbieha-viacere-projekty>

¹²⁵ <https://malacky.sk/mesto/samosprava-mesta/mestsky-urad/oddelenia-msu/utvar-strategickeho-rozvoja/projekty-z-fondov-eu-a-dotacii/obnova-verejneho-priestranstva-prostrednictvom-vybudovania-zelenej-infrastruktury-v-centre-malaciek/>

¹²⁶ <https://www.enviroportal.sk/eia/dokument/237696>

¹²⁷ <https://trecin.sk/pre-obcanov/investicie/projekty-eu/revitalizacia-verejneho-priestoru-rozkvet/>

	2. Považska street ¹²⁸ - The goal was to enhance Trenčín's urban environment by safeguarding and promoting ecosystem services through the integration of green and gray infrastructure, fostering improved quality of life and climate change adaptability.
Žiar nad Hronom	Revitalisation of the inner blocks at the 'Pod vříšky' housing estate by adding new options for sport, relaxation and children's play ¹²⁹ .
Dubnica nad Váhom	Revitalisation of the inner blocks at the 'Pod hájom' housing estate focusing on enhancing amenities - children's and workout playgrounds, senior elements, sports area. Revitalize green spaces, plant trees, add benches, waste infrastructure, and information boards ¹³⁰ .
Nové Zámky	Revitalisation of the inter-block spaces of the 'Bašta I. Zelený dvor' housing estate, with the priority to improve regional quality of life through green infrastructure and urban environment adaptation ¹³¹ .
Prešov	Presented guide in 2019, for the efficient evaluation and use of public space ¹³² .

In recent years, urban space development has been gaining more importance, underlining the importance of building safe and attractive centers of cities to invite locals and tourists. The program "Living spaces" in Bratislava is the beginning of a marathon towards a definite visible shift in the public space, a transformation to a new era for the city, notes Vallo¹³³. The primary focus for these locations is to provide residents with functional, enjoyable environments to spend their leisure time and to foster connectedness in the community¹³⁴. At current, over 40 projects are either in progress or completed

¹²⁸ <https://trencin.sk/pre-obcanov/investicie/projekty-eu/revitalizacia-verejneho-priestoru-povazska-ulica/>

¹²⁹ <https://www.partnerskadohoda.gov.sk/ziar-nad-hronom-na-sidlisku-pod-vrsky-mesto-zrevitalizuje-vnutrobloky/>

¹³⁰ <https://www.dubnica.eu/udalosti-v-meste/aktuality/mesto-ziskalo-600-tisic-eur-na-revitalizaciu-vnutrobloku-na-sidlisku-pod-hajom-2338sk.html>

¹³¹

<https://www.novezamky.sk/projekt%2Drevitalizacia%2Dmedziblokovych%2Dpriestorov%2Dsidliska%2Dbasty%2Di%2Dzeleny%2Ddvor/d-48191/p1=4466>

¹³² <https://www.teraz.sk/regiony/presov-mesto-predstavilo-dokument-o-po/392107-clanok.html>

¹³³ <https://spravy.pravda.sk/regiony/clanok/583194-bratislava-ohlasila-velku-obnovu-verejnych-priestorov/>

¹³⁴ <https://mib.sk/zive-miesta/>

under the program¹³⁵. Below are exemplary pictures of two projects at Jurigovo námestie (in preparation) and Trnavské mýto (already completed).



Picture 1 Jurigovo námestie¹³⁶



Picture 2 Trnavské mýto¹³⁷

In 2013, the city of Košice was awarded the European Capital of Culture title in 2013 and since then, multiple cultural centres have been developed, namely Kasarne Kulturpark, Kunsthalle, Výmenníky, Steel Park, Dolná brána and Amphitheater. The cultural infrastructure was built with the help of investment projects and is now used for multiple recreational purposes. Locals gladly spend their free time here, e.g. in Kasarne Kulturpark, where citizens can enjoy a playground for children, as well as take a relaxing walk around the park. Below are pictures of the Kulturpark and Amphitheater in Košice.



¹³⁵ <https://www.yimba.sk/obnova-verejnych-priestranstiev/velka-obnova-verejnych-priestorov-pokracuje-novu-podobu-ziskaju-zname-lokality>

¹³⁶ https://mib.sk/wp-content/uploads/2021/12/2_4.png

¹³⁷ https://mib.sk/wp-content/uploads/2021/04/20210622_084830000_iOS-scaled.jpg

Quite a few cities worldwide, including New York (with its High Line project), Melbourne (with its laneway revitalisation), and Copenhagen (with its cycling infrastructure), have prioritised the creation or enhancement of public spaces. In the United States, organisations such as Project for Public Spaces (PPS) work specifically on these types of initiatives.

2. Intermodality

Intermodality represents using different transport modes within a single journey, offering coordinated and connected transportation that assures seamless interchanges and reliable traveling¹⁴⁰. As cities grow more congested, an intermodal approach to transport can create efficiencies and improve commuter experience. This type of connectivity improves the quality of a typical journey experience, considering both a physical and digital level of user experience. Interestingly, convenient alternatives directly benefit even the individuals who prefer the comfort of a personal car above anything else - reduced time spent in traffic jams due to fewer cars on the streets means smoother and faster transitions within the cities for everyone.

Various cities within Slovakia (Bratislava – IDS BK, Zilina – IDS ZK, Košice and Prešov – IDS Východ) offer integrated transportation solutions, where travelers can use a single ticket and combine it for different means of transport, such as trains, public transport, and regional buses¹⁴¹¹⁴². IDS Východ currently includes suburban bus transport in the Košice and Prešov regions, however the integration of Public transport and train transport is already in preparation¹⁴³.

Furthermore, the city of Dubnica nad Váhom is currently piloting a solution for Romanian startup Rastel¹⁴⁴. This collaboration was created under the Raptor 2023 competition funded by European Institute of Innovation and Technology (EIT) Urban Mobility initiative (a body of the European Union)

¹³⁸ <https://cdn.ticketlive.cz/upload/obrazek/zvetsena/kasarne.jpg>

¹³⁹ <https://kosicefilmregion.sk/wp-content/uploads/2022/11/Letne-kino-Amfiteater-17-scaled.jpeg>

¹⁴⁰ https://www.sciencedirect.com/science/article/pii/S2352146516301910?ref=pdf_download&fr=RR-7&rr=839a63e048ebc30c

¹⁴¹ <https://imhd.sk/ba/doc/sk/17337/Cestovanie-v-IDS-BK-Zakladne-otazky-a-odpovede?text=STU>

¹⁴² <https://www.zssk.sk/integrovaný-dopravný-systém/zilinský-kraj/>

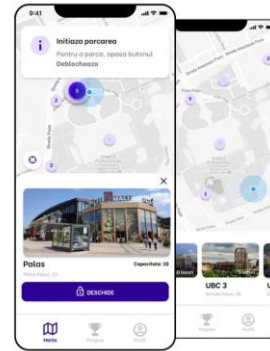
¹⁴³ <https://www.zssk.sk/integrovaný-dopravný-systém/integrovaný-dopravný-systém-v-kosickom-a-presovskom-kraji/>

¹⁴⁴ <https://raptorproject.eu/2023-city-challenge-dubnica-nad-vahom/>

with the aim to pilot innovative urban mobility solutions¹⁴⁵. It will increase the security of bike parking to support the daily commuters from the surroundings and encourage them to use train-bike way of transport during their work days.



Rastel, smart bike parking solution in the city Dubnica nad Váhom¹⁴⁶



Rastel mobile application¹⁴⁷

In addition to this, there are several interesting urban mobility solutions. The city of Bratislava has developed the 'PoMeste' app, connecting the public transport with micro mobility, where the fastest route can be identified, including the possibility to purchase public transport tickets directly¹⁴⁸. It also supports users by comparing public transport with different alternative forms of micro and active mobility, like e-scooters, bikes and walking. The app 'Citymapper' offers a similar service in Bratislava and several other cities around the globe¹⁴⁹. Moreover, 'IsItHere' offers a "everything you need to move around the city" solution including shared bicycles, scooters, cars and chargers and in numerous Slovak cities, namely Bratislava, Nitra, Trenčín, and Žilina¹⁵⁰.

Active Mobility

Active mobility can be viewed from an individually implemented standpoint and as an intermodal transport system component. It refers to all forms of human-powered mobility to get around. Walking, cycling, skateboarding, and rollerblading are different forms of active mobility. In the urban setting, this sustainable form of transportation includes bike sharing and e-scooters, promotes physical activity and helps to achieve public health goals while reducing the risks associated with overweight-related diseases. Implementing policies and building infrastructure that support walking and cycling can

¹⁴⁵ <https://raptorproject.eu/>

¹⁴⁶ https://www.dubnica.eu/evt_image.php?img=24091

¹⁴⁷ https://www.rastel.io/_next/image?url=%2Fimages%2Fproducts_showcase%2Fmobile.png&w=1080&q=75

¹⁴⁸ <https://pomeste.bratislava.sk/>

¹⁴⁹ <https://citymapper.com/bratislava?lang=en>

¹⁵⁰ <https://isithere.sk/>

drastically reduce the reliance on cars for short-distance travel and can contribute to reducing fossil fuel consumption and carbon emissions.

First, **embracing bicycle transport** presents a compelling challenge, provided that there is an overall lack of government support. In Slovakia, cycling as a mode of transportation is not widely used and only accounts for 5% of total transport¹⁵¹. The strategic support of the Slovak government is largely missing as the last "The national cycling strategy" was released in 2013 and its implementation lacked political and public support¹⁵². As the Strategy is now outdated, the Ministry has started working on a new document in 2021, but the output is yet to be presented to the public. However, a substantial funding of 100 mill. EUR has been allocated for the support of cycling and cycling infrastructure from the Recovery and Resilience Plan and a new ERDF programming period (Program Slovakia) should also include significant resources for this topic¹⁵³.

Several cities and municipalities are boldly attempting change.

The city Trnava is attempting change by prioritising support of bicycle transport. Under the leadership of mayor Peter Bročka, the aim is to create an environment where cyclists can navigate safely, and borrow and wean off bicycles easily, so that it leads to people realising they can safely and conveniently travel to work by bikes in 15 minutes¹⁵⁴. The commitment of Trnava is evident in the effort to limit motorcycle activities, which successfully led to a substantial increase in the number of cyclists¹⁵⁵.

Meanwhile Nitra is attempting progress with investments into infrastructure, evident in their Strategy of cycle route development¹⁵⁶, as for example the construction of a cycling route between the cities Nitra and Vráble¹⁵⁷, but also other initiatives as the recent announcement (December 8th 2023) of the construction of a cycling route connecting existing paths with Dolné Krškany¹⁵⁸.

¹⁵¹ <https://spectator.sme.sk/c/22476593/cycling-in-slovakia-a-free-time-activity-rather-than-means-of-transport.html#:~:text=When%20it%20comes%20to%20cycling,from%20the%20Transport%20Ministry%20show.>

¹⁵² https://cdn.climatepolicyradar.org/navigator/SVK/2013/national-strategy-of-development-of-cycling-transport-and-cycle-touring-in-the-slovak-republic_ehead60b5522dd18d1d88db561ba4354.pdf

¹⁵³ <https://euractiv.sk/section/ekonomika-a-euro/interview/statny-tajomnik-kmet-cyklodoprava-bola-v-plane-obnovy-vzdy-kritiku-som-nepochopil/>

¹⁵⁴ <https://index.sme.sk/c/23158938/cyklistov-v-trnave-pribuda-inspirovat-moze-ine-mesta.html>

¹⁵⁵ <https://index.sme.sk/c/23158938/cyklistov-v-trnave-pribuda-inspirovat-moze-ine-mesta.html>

¹⁵⁶ <https://visitnitra.eu/wp-content/uploads/2021/01/Strategia-rozvoja-cyklotras-v-NSK-na-roky-2021-2027.pdf>

¹⁵⁷ <https://visitnitra.eu/wp-content/uploads/2021/01/Strategia-rozvoja-cyklotras-v-NSK-na-roky-2021-2027.pdf>

¹⁵⁸ <https://www.teraz.sk/regiony/nitra-pripravuje-vystavbu-cyklotrasy-v/759977-clanok.html>

Moreover, this is in line with a broader cycling route development strategy. Cities in Slovakia such as Trnava, Nitra, Šaľa, Čadca, Ružomberok, Brezno, and Košice, proactively utilise the opportunity to leverage on EU funds aiming to support the green economy and sustainable urban mobility¹⁵⁹. Bratislava will receive this support in the form of 800,000 EUR to cover the expense of projects already completed (in 2022), including 25 projects and 80 kilometres of new cycling routes built, indicates the Minister of Transport Pavol Lančarič¹⁶⁰. The focus prioritises commuting to work, school, and home, extending beyond merely recreational cycling. The director of the section Strategy of Transport Rastislav Cenký emphasises the support for initiatives serving these daily commutes¹⁶¹. The national cyclo-coordinator Peter Kl'učka explains that the goal of EU funds is support of a green economy with the aim to shift people's thinking to "leaving the car at home and going to work, school, or to run errands, by a bike", through safe routes which also connect them to public transport stops¹⁶².

Unfortunately it is prone to spark controversy in the pursuit of progress every so often. One evidence of it is Bratislava, with the generated controversy and criticism from citizens around the switch of one car lane to a bike lane at Vajanského nábrežie¹⁶³, but also experts who have stated the transport situation complicates the life of both cyclists and drivers¹⁶⁴. Peter Mesarč adds that switching one lane to be completely for bikes was purely a governmental decision. Private business companies can merely support these decisions or not. However, he emphasises that the decision was fully supported by data, approved by engineers and was the only solution possible in this very frequent area to target its traffic congestion and dilute traffic elsewhere. Peter supports this decision completely, indicating it is good for the city to bring benefits in the long-term despite the short-term controversy.

¹⁵⁹ <https://spravy.rtvs.sk/2023/05/vzniknu-desiatky-kilometrov-novych-cyklotras-nie-na-rekreaciu-ale-na-cesty-do-prace-ci-skoly/>

¹⁶⁰ <https://spravy.rtvs.sk/2023/05/vzniknu-desiatky-kilometrov-novych-cyklotras-nie-na-rekreaciu-ale-na-cesty-do-prace-ci-skoly/>

¹⁶¹ <https://spravy.rtvs.sk/2023/05/vzniknu-desiatky-kilometrov-novych-cyklotras-nie-na-rekreaciu-ale-na-cesty-do-prace-ci-skoly/>

¹⁶² <https://spravy.rtvs.sk/2023/05/vzniknu-desiatky-kilometrov-novych-cyklotras-nie-na-rekreaciu-ale-na-cesty-do-prace-ci-skoly/>

¹⁶³ <https://tvnoviny.sk/domace/clanok/856647-zmena-na-vajanskeho-nabrezi-vyvolala-emocie-medzi-vodicmi-vallo-odkazuje-bratislava-sa-musi-zmenit>

¹⁶⁴ <https://www.startitup.sk/nerobte-nezmyselne-cyklotrasy-amatersky-pan-primator-expert-kruti-hlavou-nad-novym-pruhom/>



Vajanského nábrežie¹⁶⁵

Second, **support of pedestrian zones**. A notable renowned initiative here is the project “City for Kids” in Bratislava, inspired by successful implementations in Amsterdam, Barcelona, Paris and across Netherlands, where Petra Dzurovčinová perceives it is working well, which looks at the perspective of children when they walk to school. The pilot phase involves temporarily closing streets for traffic during school hours and reshaping the surrounding environment so that it is safer for children to go to and from school. The results of this project in Slovakia include not only improved air quality, the critical urban environment health indicator as we have already discussed before, but also the sense of empowerment among the children. Nevertheless, on the other hand an unusual problem arise, citizens’ disrespect. Drivers began to use pedestrian zones in Bratislava as park lots and operation companies disrespect the dedicated times for supply delivery, consequently led to the police having to increase controls in these dedicated pedestrian zones¹⁶⁶.

Mobility-as-a-Service (MaaS)

Another, more mobility-focused global trend that shapes the future of mobility is Mobility-as-a-Service (MaaS) platforms, accessible and user-friendly digital interfaces where users can plan, book, and pay for their trips instantaneously. MaaS solutions are highly beneficial for urban life - they allow those who do need individual transportation options readily available while at the same time diminishing the need to own a personal vehicle for many, which in turn should reduce the total number of cars on the streets^{167 168} and greatly contributes to environmental goals.

¹⁶⁵ <https://www.startitup.sk/wp-content/uploads/2023/11/13092023-vajanskeho-1985129-2-900x505.jpg>

¹⁶⁶ <https://www.startitup.sk/bratislavcania-su-nepoucitelni-z-pesich-zon-si-robia-parkovisko/>

¹⁶⁷ <https://www.mapbox.com/insights/mobility-as-a-service-maas>

¹⁶⁸ <https://www.diva-portal.org/smash/get/diva2:1587735/FULLTEXT01.pdf>

In Slovakia, the sharing economy has gained traction particularly in urban areas with the emergence of shared mobility services encompassing two major areas: bicycle or e-scooter sharing and car sharing. Consequently this trend contributes to a more collaborative and sustainable approach, taking the advantage of peer-to-peer sharing platforms. Embracing this trend, the system of shared bicycles and cars gained importance and operates in the cities Bratislava, Košice, Žilina and Poprad, as indicated a recent study on the Smart transport in the Slovak Republic¹⁶⁹.

Shareable e-scooters and (e-)bikes are becoming increasingly popular in Slovakia. They are commonly used by locals in several Slovak cities, including Bratislava, Košice, Žilina, Dubnica nad Váhom, Poprad, Veľký Šariš, Svit, Svidník, Prievidza, Prešov, Humenné, and others¹⁷⁰. At the workshop 'SMART as a tool for the modernization of local territorial self-government' the association of cities and municipalities of Slovakia presented the use of Smart city Antik's Verejné bicykle in 2020. They highlighted the use of over 1000 bikes in various Slovak cities (Košice, Moldava nad Bodvou, Trebišov and Poprad), over 200,000 bike journeys in Slovakia (of which the majority stemmed from Košice), and over 37,000 app downloads from May to December 2019¹⁷¹. Today, in addition to Antik, there are many providers of shared bikes, e-bikes, and e-scooters, including Rekola, Bolt, Zelený Bicykel, Slovnaft Bajk, BikeKIA, Svi, and others.

The shift to shared modes of transport reflects a growing preference and popularity of sustainable options indicating the importance of a collaborative and connected approach to urban mobility solutions in the cities of Slovakia.

Several factors pose barriers to the widespread adoption of bicycle and e-scooter sharing in Slovakia. Firstly, **safety concerns persist**, pressing the need to develop effective safety measures in urban environments. High quality roads and sufficient number of easily accessible charging stations would be a great starting point, areas that are not only essential for an effective adoption of these sustainable urban mobility solutions, but which we have highlighted Slovakia falls behind compared to other EU countries.

¹⁶⁹ <https://www.ejosdr.com/download/smart-transport-in-the-conditions-of-the-cities-in-the-slovak-republic-13070.pdf>

¹⁷⁰ <https://touchit.sk/zdielane-bicykle-obsadili-najvacsie-mesto-na-severovychode-slovenska/351241>

¹⁷¹ https://npmodmus.zmos.sk/download_file_f.php?id=1380741

Secondly, **pollution of the environment in cities**, resulting from the disposal of shared mobility devices everywhere. Poprad has introduced a potential solution to this issue by establishing charging stations that incentivise users to park the shared mobility vehicles (bicycles and e-scooters) responsibly as they provide reward in the form of free riding minutes¹⁷². "In this way, people are motivated to park near the charging station", highlights the director of development of the company Antik Telecom Peter Blaas¹⁷³.

Thirdly, **theft and vandalism**. The predecessors of Bolt e-scooters experienced instances of reckless behaviour, big problem with parking and many damage reports in Bratislava¹⁷⁴. The reaction of Bolt was the penalty implementation for improper usage and parking with the aim to tackle vandalism and ensure responsibility¹⁷⁵. For example, parking outside of designated places (clearly outlined in their app) receives a penalty of 30 EUR from Bolt, but even the police can fine this behaviour of up to 50 EUR¹⁷⁶.

Furthermore, car sharing is also becoming more popular. Shared cars can replace several private vehicles, positively impacting the overall urban mobility landscape. HoppyGo is a platform that connects car owners with those looking to rent a vehicle¹⁷⁷. It is widely used in Western Europe, and its popularity is also growing in Slovakia. The platform grew more than twofold in Slovakia in 2022 year-on-year¹⁷⁸, and car owners earned almost 70% more as in 2021¹⁷⁹. 'HoppyGo' has been present in Slovakia since April 2021, with 7500 users with the total number of cars rented at 350 in the first year¹⁸⁰. Nitra also provides a unique solution in the form of 'SHARE CAR'¹⁸¹. According to the analysis of the Carsharing System in the Slovak Republic, the car sharing situation in Slovakia is beginning to develop, where most of the population is unaware of it¹⁸². Moreover, a successful and effective

¹⁷² <https://www.teraz.sk/spravy/v-poprade-si-je-mozne-pozicat-uz-a/552209-clanok.html>

¹⁷³ <https://www.teraz.sk/spravy/v-poprade-si-je-mozne-pozicat-uz-a/552209-clanok.html>

¹⁷⁴ <https://bratislava.dnes24.sk/pohodene-na-chodnikoch-ci-zdemolovane-takto-ktosi-zaparkoval-zelenu-kolobezku-v-bratislave-442617>

¹⁷⁵ <https://www.startitup.sk/v-bratislave-sa-elektricke-kolobezky-kradnu-a-demoluju-bolt-to-aj-tak-ide-skusit-v-kosiciach/>

¹⁷⁶ <https://www.startitup.sk/v-bratislave-sa-elektricke-kolobezky-kradnu-a-demoluju-bolt-to-aj-tak-ide-skusit-v-kosiciach/>

¹⁷⁷ <https://hoppygo.com/sk>

¹⁷⁸ <https://touchit.sk/platforma-hoppygo-na-slovensku-vyrastla-viac-ako-dvojnásobne-patri-tak-k-najrychlejšie-rastucim-firmam-v-strednej-europe/472546>

¹⁷⁹ <https://www.startitup.sk/leto-prinieslo-hoppygo-rekordne-cisla-majitelia-aut-oproti-minulemu-roku-zarobili-otakmer-70-viac/>

¹⁸⁰ <https://blog.hoppygo.com/hoppygo-oslavuje-1-rok-na-slovensku/>

¹⁸¹ <https://www.sharecar.sk/en/>

¹⁸²

https://www.researchgate.net/publication/346192855_Analysis_of_the_Carsharing_System_in_the_Slovak_Republic

development of car sharing systems calls for flexible parking policies of cities and municipalities, which is one of the current barriers¹⁸³. Sandra Ryberg, the representative of Malmö, city in Scandinavia with population of 300,000 and car sharing adoption of 6,600 registered users, emphasises that the greatest barrier in the car sharing business is the availability of parking spaces and covering the spike in demand for cars during the busiest times¹⁸⁴.

MaaS platforms and solutions can bring several important benefits for cities and their urban mobility landscape:

- Reduce urban traffic congestions
- Brings costs savings to users
- Reduces parking needs in the city, hence optimises the land use inside the city and create more space for greenery and other infrastructure
- Might lead to a behavioural change replacing/reducing privately owned cars which in turn benefits the environment

A shift to electric vehicles

Electromobility in Slovakia remains not so popular, given that data portray their share on the market to be close to zero, whereas the dominant leaders remain petrol cars (50% share) and diesel cars (44% share)¹⁸⁵. However, in a broader perspective, the percentage of electromobility market share is not significantly different compared to the EU average of 1.5%¹⁸⁶. Moreover, the infrastructure for electric vehicles is more developed and is constantly expanding, thus further enabling the shift to a more sustainable means of transport.

One of the concerns in the transition from the long-term used petrol and diesel cars, already a natural habit for the population, to any other alternative is the availability of charging stations. Cities should ensure that reliable infrastructure for alternative modes of transport is provided. In the case of electric vehicles, the Slovak Association for Electromobility (SEVA) conducted an analysis and discovered that at the beginning of 2023, the total number of public charging stations was 1483 in 629 locations across Slovakia. Year-on-year, the number of public charging points increased by 45% and the number of

¹⁸³ <https://www.trend.sk/trend-archiv/car-sharing-preco-je-lidrom-nemecko-kde-je-bratislava>

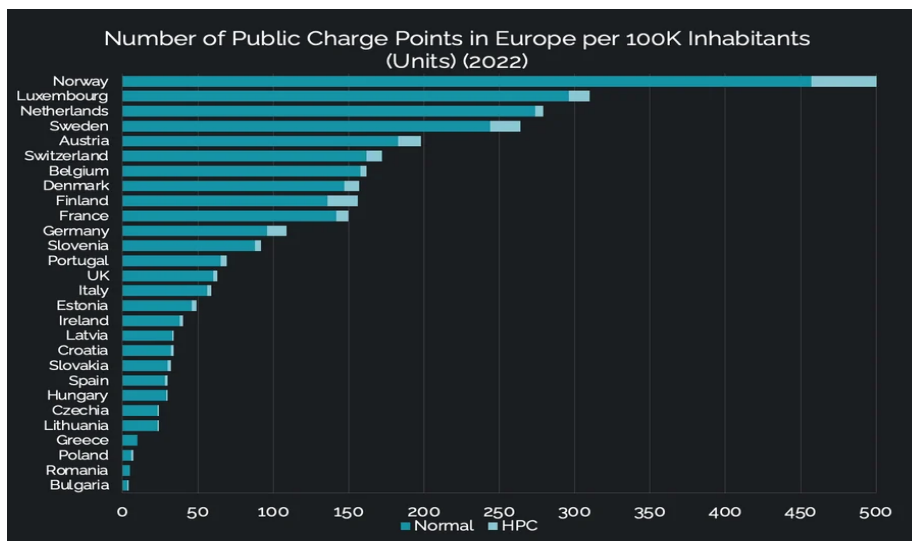
¹⁸⁴ <https://www.trend.sk/trend-archiv/car-sharing-preco-je-lidrom-nemecko-kde-je-bratislava>

¹⁸⁵ <https://www.energie-portal.sk/Dokument/elektromobily-na-slovensku-nie-su-popularne-108741.aspx>

¹⁸⁶ <https://www.energie-portal.sk/Dokument/elektromobily-na-slovensku-nie-su-popularne-108741.aspx>

locations by 46%¹⁸⁷. It is essential for Slovakia to improve the EV charging infrastructure which is crucial for the support of the successful adoption and shift to EV usage. Where to focus to support or build EV charging stations is residential charging, workplace charging, public charging¹⁸⁸.

Slovakia's charging infrastructure is currently ahead of the adoption of electric vehicles. This is evidenced by the fact that Slovakia leads EU's ranking in capacity of chargers relative to the number of EVs (16 kW compared to the EU average of 2,9 kW)¹⁸⁹. This is caused by the very low penetration of EVs in the country, as Slovakia ranks 20th in the number of public charge points per 100,000 inhabitants¹⁹⁰.



Source: ¹⁹¹

Transitioning to electric and hybrid vehicles stands out as a crucial step: by promoting low-emission vehicles, we can impact the reduction of the environmental impact, particularly in terms of CO2 emissions and air quality. Prešov being the first city operating a hydrogen bus in Slovakia¹⁹². Notably, on August 1st, 2023, Bratislava also introduced 4 hydrogen buses in the public transport system and

¹⁸⁷ <https://seva.sk/nabijacie-stance-2023/>

¹⁸⁸ <https://statzon.com/insights/ev-charging-points-europe>

¹⁸⁹ <https://zive.aktuality.sk/clanok/QW1o0J7/slovensko-vedie-rebricke-eu-v-pomere-kapacity-nabijaciek-a-poctu-elektromobilov/>

¹⁹⁰ <https://statzon.com/insights/ev-charging-points-europe>

¹⁹¹ <https://statzon.com/insights/ev-charging-points-europe>

¹⁹² <https://www.noviny.sk/slovensko/670248-prvy-vodikovy-autobus-zo-slovenska-je-pripraveny-na-predaj-vdaka-svojej-konstrukcii-odvezie-viac-cestujucich>

an additional 36 vehicles will join the fleet to serve the citizens shortly¹⁹³. And other cities are likely to follow soon provided that the Ministry of Investment, Regional Development and Informalisation in the Slovak Republic announced an initiative that will bring hydrogen buses to the Nitra and Košice regions¹⁹⁴. Moreover, the company Arriva, leader in zero-emission innovation in public transport, announced it is ready to aid the implementation of hydrogen buses and development of necessary infrastructure in Slovakia earlier this year¹⁹⁵. Additionally, this trend promotes liveable and human-centric neighbourhoods in urban centers decreasing in city pollution, both air quality and noise wise.

Pollution reduction measures

One way how environmental challenges in cities can be addressed is through the prioritisation of pollution reduction measures. As pollution levels are increasing, the significance of adopting innovative technologies and sustainable initiatives to mitigate the impact of transportation on air quality becomes evident. From promoting and supporting electric vehicles, eco-friendly low emission public transport, to initiatives for integrating green infrastructure. Pollution reduction measures is one of the key global trends in the accomplishment of clean, smart and sustainable urban mobility. Additionally it promotes smart connectivity of the nation.

Trends in Slovakia that embrace pollution reduction measures in smart urban mobility:

First, **improving air quality by collecting data.**

One notable example is the collaboration between the city of Žilina and the University of Žilina, which allows the city to assess the air quality and make predictions for the next few years. **PWS**¹⁹⁶, forecast warning system, provides up-to-date information on predicted air pollution over the next 48 hours¹⁹⁷. Another notable example to improve air quality and reduce harmful pollution exposure in Slovakia is the **LIFE** Integrated Project, supported by the European Union¹⁹⁸. The objectives of the project cover "improving air quality management, promoting air quality measures and awareness, and accelerating measures to minimise household heating and transport impacts"¹⁹⁹. To achieve these goals the team:

¹⁹³ <https://spectator.sme.sk/c/22967392/bratislava-will-get-slovakias-first-public-transport-fleet-of-hydrogen-buses.html>

¹⁹⁴ <https://www.trend.sk/spravy/nova-vyzva-ma-priniest-hornu-nitru-ksk-elektrobuse-vodikove-autobuse>

¹⁹⁵ <https://arriva.sk/arriva-je-pripravena-na-vodikove-projekty-aj-na-slovensku/>

¹⁹⁶ <http://air-tritia-test.herokuapp.com/sk>

¹⁹⁷ <https://www.zilina.sk/aktuality/2021/zilina-riesi-stav-ovzdušia-pripravila-niekoľko-opatrení-na-prispôbenie-sa-zmene-klimy/>

¹⁹⁸ https://cinea.ec.europa.eu/news-events/news/clean-air-solutions-slovakia-2023-04-26_en

¹⁹⁹ https://cinea.ec.europa.eu/news-events/news/clean-air-solutions-slovakia-2023-04-26_en

- Set up a national network of Air Quality Managers to work with municipalities
- Mobile app launch showing air quality levels in selected areas to increase public awareness about air quality in Slovakia
- Website containing sources of pollution information, what is the impact on human health and the environment, and sustainable mobility.

Second, **support of low-emission transportation**. This can be divided into private and public transportation support.

For **private** transportation, the government supports the use electric vehicles (EV) in Slovakia in a few ways. The government subsidises up to 35% of a new vehicle purchase in Slovakia²⁰⁰. This is the same case as is provided by London²⁰¹, meanwhile other cities as Paris offer cash incentives (5,000–7,000 EUR) to get more EVs on the road²⁰². Apart from the above government support, currently there are no attractive benefits for EV users (with green car plates) in Slovakia, despite initial plans to enable EVs to use bus lanes, or establishment of low emission zones (accessible merely for cars with green plates - EVs and hybrid cars)²⁰³. In other countries, there are attractive benefits that work well and incentivise the use of eco-friendly modes of transport. Notable examples include the free usage of highways for all EVs in the Czech Republic after successful registration on their official web page edalnice.cz or Austria's IG-L zones with limited car speed, aiming to significantly decrease emissions and noise pollution, which however does not apply for EVs and hydrogen powered vehicles²⁰⁴.

For **public** transportation, there are some instances in which the government supports low emission vehicles. A notable example is increasing the fleet of low emission transportation. A total of 58 new low emission vehicles²⁰⁵, including electric and hybrid buses, were bought for the cities Bratislava, Žilina and Košice, using the EU challenge to modernise public transport in 2018²⁰⁶.

Third, **other interventions, such as smart waste management**. Partnering with a consulting services company Civitta, the smart waste management solutions provider Sensoneo, a Slovak company, won

²⁰⁰ <https://www.e-car.sk/vyhody-elektromobilov/d>

²⁰¹ <https://www.joinbonnet.com/post/ev-grants-incentives-uk>

²⁰² [https://www.reuters.com/business/autos-transportation/sixty-five-percent-electric-cars-sold-france-can-quality-state-bonus-scheme-2023-12-14/#:~:text=The%20French%20government%20already%20offered,\(%241.1%20billion\)%20per%20year.](https://www.reuters.com/business/autos-transportation/sixty-five-percent-electric-cars-sold-france-can-quality-state-bonus-scheme-2023-12-14/#:~:text=The%20French%20government%20already%20offered,(%241.1%20billion)%20per%20year.)

²⁰³ <https://www.techbox.sk/zelene-ecv-na-slovensku-vsetko-co-o-nich-potrebuje-vediet>

²⁰⁴ <https://www.techbox.sk/zelene-ecv-na-slovensku-vsetko-co-o-nich-potrebuje-vediet>

²⁰⁵ <https://podkapotou.zoznam.sk/cl/1000673/1686567/V-Bratislave-uz-jazdia-ekologicke-autobusy--pridaju-sa-aj-Kosice-a-Zilina>

²⁰⁶ <https://mirri.gov.sk/mpsr/irop-programove-obdobie-2014-2020/aktuality/v-mestskej-doprave-pribudnu-elektrobuse-a-nizkoemisne-vozidla/>

the prestigious EIC Accelerator grant, just in 4 years managed to become a global top player (operating on over 50 countries) and is continuously awarded by prestigious international competitions²⁰⁷.

While the shift towards low-emission biofuels, hybrid, and electric vehicles captures much attention, the transformation extends beyond vehicle types. Many mechanical devices, vehicles, buildings, and industrial processes must be transformed to become more energy-efficient via renovation or retrofitting. Furthermore, integrating sustainable waste management practices into the urban mobility framework is vital. Lastly, as already mentioned earlier, including more green spaces in the overall city planning process helps the city combat both noise and emissions.

Changes in city logistics and infrastructure

The vision is to unburden cities from the intensity of cars, creating a vibrant, pedestrian-friendly urban space which prioritises the well-being and connectivity of residents.

Slovakia boasts a very well-developed delivery services network and a multitude of last-mile service providers, such as DPD electrocars, Voltia, Dodo and Svihaj Suhaj. While some provide more sustainable delivery services by using electric vehicles, others focus on deliveries using bikes and other active mobility solutions. Delivery platforms for food and merchandise, such as Bolt, Wolt, Food Panda and others, also use cycle couriers in Slovakia for their service to contribute towards a greener environment. During the COVID-19 pandemic, the demand for these services rapidly increased, and with a positive response from the public, these services remain highly in demand.

In the realm of waste management, the Slovak companies Sensoneo²⁰⁸ and WAMA²⁰⁹ are at the lead of it's revolution. They collect data about waste volume and help manage the waste collection more effectively. This data-driven approach contributes to reduced urban pollution and fostering healthier living environments.

Change in city logistics and infrastructure is demonstrated in Slovakia in following selected ways:

First, change in the behaviour of drivers. The aim is to get cars out of cities, especially city centres, tackling challenges such as congestion, air pollution, noise pollution etc.

- Decreased number of car lanes in the city centre

²⁰⁷ <https://sensoneo.com/sensoneo-won-a-prestigious-grant-from-the-european-innovation-council/>

²⁰⁸ <https://sensoneo.com/sensoneo-won-a-prestigious-grant-from-the-european-innovation-council/>

²⁰⁹ <https://wama.sk/o-n%C3%A1s>

- Decrease in the permeability of streets e.g. the controversy case at the Vajanského embankment
- Increase in capture parking lots
- Increase in the price of parking tickets and limits on the number of hours in cities

Second, delivery services using emission-free transport. Parcels delivery company GLS confirms their goal to deliver emission-free not only in Bratislava, but in all regional cities in Slovakia after a successful test period²¹⁰. GLS will be expanding their electric vehicles fleet to achieve this goal.

Smart and Data-driven solutions

The Smart City concept has gained immense traction over the past few decades. A smart city is a municipality that uses information and communication technologies (ICT) to improve operational efficiency, public information sharing, and the quality of government services and citizen welfare. While the precise definition varies, the overarching mission of a smart city is to use smart technology and data analysis to optimise city functions and drive economic growth while improving citizens' quality of life²¹¹. Examples of IT-based solutions include a vehicle navigation system, e-parking, e-tickets, info-mobility signalisation, demand-responsive transport, car sharing, bike sharing, and public transport live tracking.

Smart and Data-driven solutions in urban mobility in Slovakia can be categorised in several ways.

First, **parking**. According to the “Smart transport in the conditions of the cities in the Slovak Republic” report²¹², Slovakia is already implementing smart parking solutions. Additionally, cities of Bratislava, Košice, Prešov, Nitra, and Trenčín are implementing the infrastructure of charging stations for electric cars and e-bikes. In places where a new parking policy was introduced 3 years ago, streets and parking spots cleared up, shares Petra Dzurovčinová, of Bratislava. Moreover, the city further supports these efforts by introducing a city parking application to make it easier for drivers to park their vehicles.

Second, **smart transport**. The results from the study “Smart transport in the conditions of the cities in the Slovak Republic” report²¹³ show the following. The capital city of Bratislava and the city of Prešov

²¹⁰ <https://gls-group.com/SK/en/about-gls/gls-group/climateprotect/>

²¹¹ <https://www.techtarget.com/iotagenda/definition/smart-city>

²¹² <https://www.ejosdr.com/download/smart-transport-in-the-conditions-of-the-cities-in-the-slovak-republic-13070.pdf>

²¹³ <https://www.ejosdr.com/download/smart-transport-in-the-conditions-of-the-cities-in-the-slovak-republic-13070.pdf>

are introducing smart transport systems within traffic management navigation systems to ensure fluidity. Furthermore, the introduction of information boards at stops for citizens has already been implemented in the capital Bratislava and it is now being implemented in Košice, Žilina and Trenčín. Free Wi-Fi in public transport or in public areas is available in the capital Bratislava, Košice, and Žilina. It is also currently being implemented in the cities of Trenčín, Nitra, and Banská Bystrica.

Third, **open data**. Open data portals, such as Open Data Bratislava or Open Data Košice²¹⁴, also play a pivotal role in ensuring efficient and effective urban mobility.

- Firstly, they provide access to a wealth of information that can be used by city planners, policymakers, and transport authorities to make informed decisions and implement changes. Traffic patterns, public transport usage, accident hotspots - all can be used to identify areas that need improvement and provide targeted solutions. These portals are also a valuable resource for developers and researchers, creating new innovative solutions to address local challenges and supporting them in providing services to the city population.
- Secondly, giving citizens access to the same amount of information ensures openness and transparency and supports the uptake of new technologies and solutions by providing a better understanding of the reasons for city officials' choices.
- Finally, it can support research and policy analysis, providing vital information on environmental sustainability, such as emissions or areas with poor air quality. This data can inform and urge policies and initiatives working towards environmental impact reduction.

Adopting smart and data-driven city solutions, particularly in traffic management, can significantly impact and help manage many of the urban mobility challenges discussed in this report. By leveraging technology and data, cities can reduce idle times and alleviate congestion, understand the behaviour and preferences of citizens, respond to environmental concerns and remain at the forefront of the shift to become smart, sustainable and people-centric.

²¹⁴ <https://opendata.bratislava.sk/en/dataset/category/doprava>, <https://opendata.kosice.sk/>

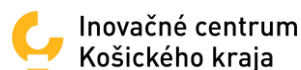
THE FAST LANE: PROGRESS THROUGH INNOVATIVE SOLUTIONS

In this inevitable innovation shift, it's not solely the responsibility of governments and policymakers to drive the change. Startups are emerging as significant players, steering urban mobility advances with new and creative approaches to solve existing problems. Let's now take a closer look at the startup world and the most prominent urban mobility solutions taking Slovakia by storm.

The Rise of Slovakia's Urban Mobility Entrepreneurs

The main role of urban mobility startups is to develop and spread innovations that make the lives of people in cities more comfortable and convenient. Startups offer solutions that include lean testing and fast impact on the citizens. Their solutions have high flexibility to adjust to the needs of their users and emerging global trends and thus offer great potential for the cities. Startups also attract talent both locally and from abroad. This innovation capability increases even more when they conduct a living dialogue with multiple stakeholders, users and the general population. Nevertheless, being a startup in today's economy doesn't come without challenges, such as funding, access to market or access to talents.

One way startups overcome these challenges is participation in **acceleration programmes**. Notable programmes in Slovakia include [Challenger Accelerator](#), [Perry Talents](#), [INQB Accelerator](#), [ICKK Accelerator](#), [Inkubator TUKE](#), [Acceon](#) and others.



Let's meet some of the **most promising urban mobility startups in Slovakia**:

Mobilyze	BikeUP
Mobilyze helps to develop electric vehicle (EV) infrastructure by the identification of the most efficient placement of charging stations. They estimate the utilisation of placing EV chargers at	BikeUP is in the European market for children's bicycles. They focus on renting bicycles on a monthly subscription model, just like someone paying for Netflix every month. Consumers can rent and use a kid's bike until they return it.

any location in Europe to maximise the revenue from public EV charge points.

AgeVolt

AgeVolt provides a charging system that links the chargers to the overall energy management of the building and can optimise charging in real time for the current load. They significantly contribute to the comprehensive e-mobility ecosystem and energy efficiency.

YourLOX

YourLOX creates a network of smart lockers that allow residents to rent equipment for sports, games or active recreation on public playgrounds right on the spot via an app. LOXes allow people to play basketball, frisbee or use dumbbells without buying any new equipment.

Sensoneo

Sensoneo, global leader in smart waste solutions, efficiently addressing waste management challenges. Beginning with fill-level sensors and smart waste management software, their services now encompass monitoring, route planning, factory waste, take-back systems, and deposit return integration.

Tirn Technology

Tirn Technology develops easy and ready-to-use simulation software for collaboration between operators and manufacturers by using the current possibilities of AI, publicly available relevant data, and modern simulation models to shape the future of electric mobility faster. The zero - emission bus simulator optimises bus model, powertrain, energy storage technology, charging infrastructure, enabling users to predict total cost of ownership and CO2 reduction more accurately.

ParkingAround --- GOSPACE Tech

ParkingAround is a smart parking solution on a mission to make parking easier while benefiting communities and the environment. They bring innovative IP-protected technology features for smart parking sensors. They help companies and their employees to make the most of their parking space potential.

BatteryCheck

BatteryCheck is an independent patent-pending technological solution focusing on (rechargeable) batteries. They use data analytics and Internet of Things (IoT) technologies to gain insights into battery usage patterns to help customers make informed decisions about reducing their carbon footprint, improving efficiency, reducing costs, and enhancing overall performance.

Crosswalk

Kalm IT

"Crosswalk by aria33" is an advanced pedestrian crossing projector. Its innovative illumination enhances pedestrian visibility and safety at night, using automated detection to sense pedestrians without their input. The projector can easily be integrated into existing road infrastructure and installed on various electric and light poles of different diameters and types.

Kalm IT is a secure platform for dynamic and static traffic and urban mobility big data. They help cities make smarter decisions and save financial resources with better traffic and mobility analysis. KALM IT uses its own AI models and machine vision to analyse data and provide analytical reports for future city planning.

MERATCH

MERATCH offers water management solutions through real-time measurement of critical quantity and quality factors. With wireless connectivity, seamless plug-and-play installation and IoT innovations, MERATCH takes water monitoring into the future. It can also wirelessly measure temperature and other water parameters and effortlessly connect to global IoT networks and satellites.

Panza Robotics

Panza Robotics is a high-tech innovation company focused on research and manufacturing of advanced robots. They are developing semi-autonomous four-legged robots with embedded sensors to move around people and help them accomplish their everyday tasks. Those robots monitor various environments and help to predict dangerous conditions or hazardous situations.

Under the Spotlight

We've interviewed two of the startups presented above - **YourLOX** and **Sensoneo** - to better understand their growth journey as urban mobility startups in Slovakia and to hear how they imagine the future of urban mobility. It emerges that it is crucial to focus on people and community goals, leverage data and technological advances, and establish strategic collaborations and partnerships for successful adoption and hence a step towards sustainable, smart and cohesive environments.

Interview with Patrik Dolinský, Founder of YourLOX

1. What is the added value of your startup for the urban mobility ecosystem?

YourLOX creates a **network of smart lockers called LOXes**. LOXes enable everyone to **rent equipment** for sport and leisure activities **on the spot** via an app.

LOXes provide us with significant added value in the form of data. Data such as **"Average age of users**

on public playgrounds”, “The most favorite activities”, and “Time preferences for performing outdoors activities”. Gathered data and feedback from our end-users, inhabitants and tourists, unlock the opportunity to build meaningful public zones that are **personalised to their needs**.

2. What was the game-changing factor, situation or help that you received in growing your company?

We have two most significant factors that helped us. The first is a 10 000€ grant from the “**myEUspace competition**” that **helped us to finish 1st pilot LOX** and test it in a real environment. The second factor is the 1st prize of 10 000€ from **Challenger Accelerator Urban: Creative 2022**, which helped us to create a **long-term partnership** with the city of Košice and spread info about our company to the national and local media.

3. What is your vision for the transformation of the urban mobility sector, and how do you contribute to this sector?

I love **futuristic views** of how **public transport, delivery services and leisure time options** may look like. When I speak about **smart cities**, I usually use the following use case:

“Imagine, you may delegate your time for routine activities such as buying groceries, preparing dinner, doing boring housework to the interconnected ecosystem of providers of such services, and automate it.

The extra time may be used for building deeper relationships, creating meaningful projects or learning new skills.”

YourLOX makes sport available, saves time and gives the opportunity to act spontaneously.

Interview with Martin Basila, CEO, Sensoneo

1. What is the added value of your startup for the urban mobility ecosystem?

[Sensoneo’s smart waste management solution](#) can monitor waste production in real-time and manage waste smarter by optimising capacities, frequencies, and collection routes of waste pickups in cities. This reduces unnecessary trips and congestion caused by traditional fixed schedules. Through precise waste collection scheduling, cities can foster **cleaner air (reduced carbon emissions), reduce traffic, and improve quality of life**. Sensoneo's integration with urban mobility enhances operational effectiveness and **paves the way for greener, smarter cities, prioritising resource optimisation and environmentally friendly approaches**.

2. What was the game-changing factor, situation or help that you received in growing your company?

Sensoneo's journey to becoming the global leader in waste management with its installations in over 82 countries across five continents has been punctuated by numerous transformative milestones. Among these, [the collaboration with ASEKOL within the take-back system project](#) is one of the pivotal moments. Sensoneo successfully unveiled Deposit Return Schemes (DRS) through this strategic collaboration, revolutionising the recycling landscape. This breakthrough not only cemented Sensoneo's position but also opened doors to new possibilities and global influence. Sensoneo stands as the sole company worldwide to successfully implement DRS systems in five countries.

3. What is your vision for the transformation of the urban mobility sector, and how do you contribute to this sector?

The vision of Sensoneo involves leveraging technology to create a more sustainable and environmentally friendly urban environment. Installing fill-level monitoring sensors has great results for collectors of irregular commodities. Especially with glass, it is hard to predict when the bins are full, as they tend to have irregular filling patterns. In some cases, our customers report ROI in 7 months, -20% of waste collection cost, and a complete redesign of their operations that directly contributes to improvements in urban mobility.

CO-PILOTING CHANGE: MULTI-STAKEHOLDER APPROACH TO URBAN MOBILITY

Just as steering a large complex vehicle towards the finish line - the future of smart and sustainable urban mobility - working together is a team of skilled co-pilots, navigators, and engineers, each playing a crucial role in driving forward. And like in a well-coordinated driving team, where the driver, navigator, and support crew each have essential roles, the urban mobility landscape requires the coordinated efforts of various groups to move towards more liveable, innovative, and efficient urban spaces, committed entrepreneurial talent, and competitive mobility businesses.

This diverse crew of mobility stakeholders represents:

- **EU-Level Policymakers** play a key role in setting the regulatory framework and policy guidelines that drive sustainable urban mobility initiatives. Their decisions can influence funding priorities, environmental regulations, and the overall direction of transportation planning across Europe.

- **Cities** are at the frontline, implementing mobility solutions tailored to their unique urban situation. Their strategies can range from expanding cycling infrastructure and pedestrianising areas to investing in smart traffic management systems and public transport enhancements.
- **Startups and Businesses** are often the main source of disruptive innovations, these entities introduce cutting-edge solutions like app-based ride-sharing, electric mobility options, and smart parking systems. Their agility allows for rapid adaptation and implementation of new ideas.
- **Universities and Research Institutions** contribute through in-depth research, technological development, and thought leadership. They offer data-driven insights and experimental projects that can guide policy and practice.
- **Associations** provide a voice for various groups like cyclists, pedestrians, and public transport users. They play a critical role in advocating for inclusive and equitable mobility solutions.
- **Investors** provide the necessary financial backing for urban mobility projects, particularly in supporting innovative and potentially high-risk ventures that traditional funding sources might overlook.

Effective dialogue and strategic interactions between these groups strengthen the innovation community by educating and inspiring mobility solutions for twenty-first-century cities. Especially when seeking concrete and tangible results, as opposed to drawn-out discussions without a clear action plan and defined roles and responsibilities of each stakeholder. So, how can we make it effective, and which steps of planning and implementation benefit most from the collaboration? The following areas of cooperation can be a good starting point to better understand the importance of the multi-stakeholder approach to urban mobility.

Holistic City Planning

This involves looking at the city as an interconnected ecosystem where changes in one aspect of mobility also affect others. For example, enhancing public transport should go hand in hand with improving pedestrian infrastructure and cycling paths. It is difficult to make a switch from the convenience and comfort of own car to public transport if walking towards or from the nearest bus stop takes too long or is unsafe. Another great example is strategically placing convenient alternative mobility options next to train stations and other city hotspots, such as universities as well as shopping and commercial centres, to offer quick and easy commutes for students and workers, even those commuting from surrounding areas and smaller towns. Many new city developments are happening outside of the current city boundaries, often having limited access to public transport or none at all.

Working together, private developers and cities can plan the next emerging neighbourhoods and exact transportation needs, supporting citizens' access to the rest of the city, as well as essential services, such as shopping, hospitals and schools. New roads and streets to and from those new neighbourhoods can already be planned with alternative modes of transport in mind - secured bicycle lanes, safe and wide sidewalks for pedestrians, regularly maintained and cleared from snow in winter, energy-efficient lighting solutions, and smart and inclusive traffic lights and crossroads, promoting people's safety even further.

Resource Optimisation

Each of the identified stakeholders has their own set of very specific resources that support them in their daily work. The scientific community can back their claims with an abundance of research, cities have the power to make important decisions and data, and startups have the technologies, talent and agility to react fast and implement their solutions efficiently if provided with adequate funding and support. For all of them, the resources they do not possess are either hard or expensive to acquire. By pooling resources – whether financial, intellectual, or technological – stakeholders can achieve more impactful results than working in silos and can reduce the instances of duplicating effort.

Innovation and Technology Adoption

Embracing new technologies, from electric buses to smart traffic lights, can significantly improve urban mobility. However, next to technology itself and funding, this requires both supportive policies and public acceptance. EU-level incentives can encourage cities to invest in infrastructure upgrades while academia can support the successful piloting by analysing patterns and data extracted. Cities can also significantly improve the adoption of new startup-created solutions by working together and providing needed public infrastructure, such as designated parking spots for e-bikes and scooters. Additionally, data gathered from the successful implementation examples in other cities or countries, can support the formation of a positive public opinion and help during the transition time, especially when actively engaging with the public to understand their needs and concerns.

Equity and Accessibility

Ensuring that mobility solutions cater to all segments of society, including the most vulnerable, is crucial for creating inclusive urban environments. Transport poverty, as already discussed, is a real problem in today's society and needs to be taken into account by all to ensure policy, research, decisions, infrastructure, and even new innovations are inclusive for all citizen groups. Drawing

conclusions from the use patterns of only those who can already use the mobility solutions, have them available and can afford them can further increase the divide.

Policy and Regulatory Frameworks

Effective policies and regulations are essential to guide and support sustainable urban mobility initiatives. They must be adaptable to technological advancements and include technology developers and researchers in the conversation. Furthermore, to ensure that policies do not harm the innovation process, startups, scaleups, and other businesses need to be able to voice their opinion. Lastly, the general public's and future users' voices must be heard, and their concerns over safety, accessibility, and privacy must be considered.

Sustainability Goals

Looking from the bottom up, new innovations must align with the broader sustainability goals of the city, country and Europe. Aligning mobility strategies with broader environmental sustainability goals helps tackle issues like pollution and climate change - a concern we all share in a quest for better and safer cities for ourselves and future generations. Cities, open to communicating their long-term sustainability strategies with other urban stakeholders, can steer local innovators and researchers to reach those strategies together without clashing in the process.

Adaptability and Resilience

Building urban mobility systems that can adapt to future challenges, such as population growth, technological disruptions or, as we witnessed in recent years, unforeseen pandemics, ensure long-term effectiveness and relevance. Choosing more sustainable fuels and materials and implementing energy-saving mechanisms into new and existing infrastructure can future-proof our cities even further. Also, a collaborative approach in planning, forecasting and implementation can ensure mobility and infrastructure solutions meet the current and future needs of the citizens.

NEXT STOP: INITIATIVES AND RECOMMENDATIONS

In the earlier sections of the report, we've covered what urban mobility is, why it is important, challenges of urban mobility, its evolution in Slovakia as well as emerging trends and opportunities, discussed ways in which different stakeholders can work together to support the shift to sustainable

and smart urban mobility, showcased some of the prominent startups and had an opportunity to get to know some city, business and academia representatives and their view on Slovakia's urban mobility scene.

Following are the recommendations outcoming from the report:

- 1. Entrepreneurship - an emergence and/or launch of new projects and solutions. This means dedicated entrepreneurship focused on the topics discussed in this report in the smart and sustainable urban mobility arena.**
- 2. Active municipal management - increase the capacity of mayors and management at municipalities to scan, pilot and implement new solutions in urban mobility.**
- 3. Awareness raising - every year there must be an awareness campaign put into operation to explain the benefit of any city intervention to the citizens. This can increase the support of the population for further interventions.**
- 4. Support from the national government - adequate and effective government support not only providing the infrastructure and investment resources, but also incentivising and motivating the nation to ease the switch to more sustainable modes of transport.**

The next stop in this urban mobility journey is understanding how we all can contribute. Here is a list of selected urban mobility-focused initiatives in Slovakia:

[European Mobility Week](#)

EUROPEAN MOBILITY WEEK is the European Commission's flagship awareness-raising campaign on sustainable urban mobility. It promotes behavioural change in favour of active mobility, public transport, and other clean, intelligent transport solutions. The main event takes place from 16-22 September each year, culminating in the popular Car-Free Day. Local authorities are encouraged to use the main week to try out innovative planning measures, promote new infrastructure and technologies, measure air quality, and get feedback from the public. With more towns and cities joining every year and with its huge media appeal, the campaign is widely recognised as a driving force towards sustainable urban mobility in Europe and beyond.

[EIT Urban Mobility](#)

The EIT Urban Mobility Hub in Slovakia organised a total of 11 workshop in 2023, whose aim was to raise awareness of entrepreneurship and develop entrepreneurial skills among university students

and young professionals in the urban mobility field. The Hub in Slovakia focused on urban innovations and organised several events and meetings with the representatives of cities dedicated to implement mobility-related innovations. As part of the support and development for startups, the Hub regularly organises a conference and competition focused on the solutions in the field of urban mobility, where startups have the opportunity to present their solutions in front of a jury and gain accelerated access to investment or grant funding from EIT Urban Mobility.

Urban Mobility Day

An annual conference organized by the EIT Urban Mobility RIS Hub Slovakia. The last edition of the conference took place on September 19th, 2023, at Kulturpark in Košice. The event was part of the largest Slovak technology conference, SlovakiaTech. It included a competition for urban mobility projects and startups focusing on “active urban mobility, sustainable urban logistics, public space creation, future mobility, mobility and energy, or pollution reduction”²¹⁵, and a unique opportunity to present their solutions to investors and an expert jury, and win monetary prizes and expert consultations.

CITYTHON

Citython is an annual international event focusing on urban challenges in RIS countries in which the participating teams work on implementing their ideas from inception to presentable projects or prototypes in 54 hours. In the last edition, they targeted urban mobility, where a group of experts and students in the fields of urban issues, business, UX, marketing and big data worked together to create innovative solutions for our cities. Experienced mentors and speakers accompanied the teams during the weekend. The culmination of the evening was a 5-minute presentation, Q&A, and evaluation by a panel of judges who selected the 3 winning teams. In Slovakia, CITYTHON 2022 took place in Košice and Žilina.

Climathon Bratislava

Climathon Bratislava is an innovation event where teams of students and enthusiasts from all over Slovakia create solutions in collaboration with city representatives, experienced mentors and experts. Climathon Bratislava is a part of the global initiative Climathon, which involves more than 140 cities from 56 countries worldwide. Participants come together for a weekend event to work as teams to find creative and innovative solutions to the challenges of the city of Bratislava and have a chance to

²¹⁵ <https://www.eiturbanmobility.eu/events/urban-mobility-day-at-slovakiatech/>

win €10,000 worth of prizes. The vision of the city of Bratislava is to become a resilient and sustainable city that provides a liveable urban space to its citizens. As part of the Climathon, the city is addressing the need for the efficient functioning of its infrastructure, including mobility, and creating services that support its climate resilience. Innovative solutions are based on live city data and valuable data from partners, which can only be accessed during the Climathon. Climathon is an annual event organised by the city of Bratislava, Civitta and Innovation League, together with an extensive list of partner organisations, and has been running since 2020. Following are several interesting and relevant challenges Climathon has addressed over the years:

Year	Challenges/themes the startups were solving
2023	<ol style="list-style-type: none"> 1. How to make Bratislava and its citizens more resistant to extreme weather fluctuations? 2. In what ways could we increase the involvement of residents in the sustainable development of the city using digital tools such as Bratislava ID? 3. Opened challenge: How can we as citizens help the city become more sustainable and fight climate change?
2022	<p>To improve in-city life and mitigate climate change effects.</p> <ol style="list-style-type: none"> 1. How to optimize city services in case of extreme weather and climatic events? 2. How can the city improve its preparedness for the expected long-term climate changes? 3. How citizens can help the city in the fight against climate change?
2021	<p>To make Bratislava a city resistant to climate changes.</p> <ol style="list-style-type: none"> 1. Prediction and visualisation of climate stressors (heat islands, floods, etc.) 2. A more efficient planning of renewable resources 3. Optimisation of waste management, public transport and electromobility.
2020	<ol style="list-style-type: none"> 1. How to motivate citizens and involve them in the process of transforming Bratislava into a city resistant to climate change? 2. How to increase the use of urban transport and ecological transport alternatives in the city?

Sample of recommendations and initiatives for different types of stakeholders in urban mobility includes the following:

EU-Level and National Policymakers

- Provide financial support and incentives through existing funding schemes for sustainable urban mobility projects and research.
- Develop comprehensive policy frameworks that encourage the adoption of sustainable mobility solutions.
- Facilitate collaboration and knowledge exchange between EU countries to share best practices in urban mobility.

Cities

- Invest in infrastructure that supports sustainable modes of transport like cycling, walking, and public transit.
- Conduct campaigns to educate citizens about the benefits of sustainable mobility and encourage behaviour change.
- Implement and support pilot projects for innovative mobility solutions to test their feasibility and effectiveness.
- Facilitate the exchange between officials, academia and industry to maximise knowledge and resources, enabling shared ownership of innovative projects.

Startups and Businesses

- Develop and provide innovative mobility solutions that address real and existing urban challenges.
- Work closely with city governments to align products and services with the city's mobility needs and regulations.
- Engage with local communities to understand their needs and tailor their existing solutions accordingly.
- Support the less tech-savvy population with accessible and easy-to-use solutions.
- Take into consideration less represented and vulnerable populations and their challenges.

Universities and Research Institutions

- Conduct inclusive research in sustainable urban mobility to develop new insights and technologies.

- Offer educational programs focused on urban mobility to train the next generation of urban planners and engineers.
- Engage in partnerships with the private sector and governments to bring academic research into practical application.

Associations

- Advocate for policies and practices that support sustainable urban mobility.
- Organise forums and discussions to gather public input and raise awareness about urban mobility issues.
- Share successful case studies and best practices in urban mobility with a wider audience.
- Represent the interests of often underrepresented citizen groups, such as the elderly, young people, people with disabilities of those affected by transport poverty.

Investors

- Invest in and support startups and projects that are pushing the boundaries in sustainable urban mobility.
- Support risk assessment and management for new mobility ventures to ensure sustainable growth.
- Focus on long-term impacts and returns when investing in urban mobility projects, considering their social and environmental benefits.

Citizens

- Actively choose more sustainable modes of transport like cycling, walking, or using public transit over personal vehicles whenever possible.
- Participate in community discussions and initiatives related to urban mobility, providing feedback and ideas to local authorities and organisations.
- Advocate for and support local policies and initiatives that promote sustainable urban mobility, such as car-free zones or improved cycling infrastructure.
- Stay informed about urban mobility issues and share knowledge with peers to raise awareness about the importance of sustainable transportation.
- Embrace new technologies and smart mobility solutions like ride-sharing apps or e-scooters, contributing to a data-driven approach to urban mobility.

- Recognise and adapt personal habits and behaviours that contribute to congestion and pollution, and be open to new ways of commuting.

With a common goal for our cities, we can do it all if we continue to have strategic dialogues and collaborations and share our expertise and data. To end, we would like to share Petra Dzurovčinová's dream for Bratislava - **"To be brave to make it a city for people, rather than a city for cars"**. Ultimately, this ambitious dream extends beyond Bratislava to other Slovak cities as well, encouraging Slovakia to become the leader in Europe in efficient, smart and sustainable urban mobility.

Appendices

Appendix 1. Table comparison of Slovak cities Bratislava and Košice with other cities with comparable populations regarding the average time per 10 kilometres

City (Country)	Population (2023)	Average Travel Time/ 10 km	Rank	Average speed in rush hour (km/h)
Bratislava (Slovakia)	423,737 ²¹⁶	13 min	256	39
Košice (Slovakia)	236,563 ²¹⁷	13 min 40 sec	220	37
Brno (Czech Republic)	369,559 ²¹⁸	13 min 20 sec	240	37
Nice (France)	338,620 ²¹⁹	18 min 20 sec	90	28
Lyon (France)	472,317 ²²⁰	20 min 40 sec	53	23
Ljubljana (Slovenia)	272,220 ²²¹	13 min 20 sec	245	38
Malaga (Spain)	568,305 ²²²	14 min 40 sec	186	36
Tallinn (Estonia)	394,024 ²²³	18 min 20 sec	91	28
Bologna (Italy)	366,133 ²²⁴	13 min 40 sec	217	35
Florence (Italy)	349,296 ²²⁵	16 min 40 sec	124	30

²¹⁶ <https://worldpopulationreview.com/countries/slovakia-population>

²¹⁷ <https://worldpopulationreview.com/countries/slovakia-population>

²¹⁸ <https://worldpopulationreview.com/countries/czech-republic-population>

²¹⁹ <https://worldpopulationreview.com/countries/france-population>

²²⁰ <https://worldpopulationreview.com/countries/france-population>

²²¹ <https://worldpopulationreview.com/countries/slovenia-population>

²²² <https://worldpopulationreview.com/countries/spain-population>

²²³ <https://worldpopulationreview.com/countries/estonia-population>

²²⁴ <https://worldpopulationreview.com/countries/italy-population>

²²⁵ <https://worldpopulationreview.com/countries/italy-population>

Appendix 2. Table showcasing the five best and five worst cities in Europe in regarding the average time per 10 kilometers

City (Country)	Population	Average Travel Time/ 10 km	Average speed in rush hour (km/h)	Rank
London (United Kingdom)	7,556,900 ²²⁶	36 min 20 sec	14	1
Dublin (Ireland)	1,024,027 ²²⁷	28 min 30 sec	17	3
Milan (Italy)	1,236,837 ²²⁸	27 min 30 sec	18	5
Bucharest (Romania)	1,877,155 ²²⁹	27 min 20 sec	17	7
Paris (France)	2,138,551 ²³⁰	26 min 10 sec	19	11
Almere (Netherlands)	176,432 ²³¹	8 in 20 sec	67	389
Den Bosch (Netherlands)	134,520 ²³²	8 min 40 sec	58	387
Utrecht (Netherlands)	290,620 ²³³	9 min 10 sec	56	378
Modena (Italy)	158,886 ²³⁴	9 min 20 sec	58	377

²²⁶ <https://worldpopulationreview.com/countries/united-kingdom-population>

²²⁷ <https://worldpopulationreview.com/countries/ireland-population>

²²⁸ <https://worldpopulationreview.com/countries/italy-population>

²²⁹ <https://worldpopulationreview.com/countries/romania-population>

²³⁰ <https://worldpopulationreview.com/countries/france-population>

²³¹ <https://worldpopulationreview.com/countries/netherlands-population>

²³² <https://worldpopulationreview.com/countries/netherlands-population>

²³³ <https://worldpopulationreview.com/countries/netherlands-population>

²³⁴ <https://worldpopulationreview.com/countries/italy-population>

Appendix 3: Interview with Petra Dzurovčinová

Justina: So, my name is Justina. I am from Lithuania, currently in Vilnius. I'm project manager in Civitta, and I'm part of the innovation team. So, we are doing various types of innovation, projects, startup ecosystem support, SME scale up both Horizon Europe projects, local, acceleration projects with universities, with other organizations, as well as work with a more, with more general type of innovation projects as three partnerships in Europe for European Commission. And basically all very broad range of different innovation type projects, and my and our Slovakian colleagues, have asked for support in compiling this report on urban mobility. So, this is me, this is my profile. I also, peaked at your LinkedIn profile, and I noticed that we've, both of us have been working in TechX as well. So quite an interesting thing. I've also been involved in FedEx film, Andex, Brussels. Nice.

Petra: Okay. So, well, I've been working as the Chief Innovation Officer for the Central West Law for five years. Now, we're mostly focusing on three topics, digital services and improving the experience of residents, that takes a majority of our work because that's where we can make, the most impact. We're just starting, discussions with our transit authority to improve their services, like payment for tickets and information on their website. So, and we did some little pilots in a mass application. Then we run a city lab, which is like a framework for testing and piloting new innovation in the city environment where we've run a couple of pilots on sensory networks and cameras counting pedestrians or cyclists. So just trying to figure out what is the best way when we roll out a citywide network of cameras and sensors. And the third one is a cooperation with our partners public, private academic. One of the most noticeable ones is, for example, Klamath on, we did with Civitta, which is the fourth year just now. But we are trying to work with universities more closely as well. So that's basically me in a nutshell.

Justina: This is very interesting. This is super interesting. This is something I think most of us will be very excited to do and support these types of endeavors. It's, it's really exciting. So, it does touch upon our topic quite well. So what we are trying to do in our EIT Urban Mobility project, we are generating a report that we also want to compare Slovak against other countries in Europe, briefly, not the mangle of the report, but one of the outputs, as well as talk about the research and data, that we can gather on the, on the mobility. Talk to local talk mobility experts. Just last week, I believe I had an interview with Bolt. So, it was also quite insightful and very interesting. And I think the main thing that we want to talk is without, because this is a super broad topic, you can go anywhere from infrastructure and how basically crossings work into very specific things. So our report will focus on more of a narrow, stakeholder identify topics and issues, because it's better to go deeper for us into specific identify topics and go super, super broad. So, we do believe that our, that your experience from the city perspective especially will be invaluable for this report. And yes, and maybe to start with, you already touched upon how urban mobility is related to, to what do you do by

yourself in your daily work, see any of the, what would be the most pressing challenges when talking to urban Mobility for you? In Slovak in general? In, but lava or in or broader, looking broader as well.

Petra: What's so basically, bit of a cult cultural context first. They're very much, like majority of its new European countries, tied to our cars. It's a, it's a status of wealth and, and success. So that still hasn't kind of passed. So, the number of cars have been steadily increasing in Bratislava. I think, you can ask Civitta colleagues, but I think the number of cars is larger, the number of residents, or it's coming closer to that, which is really crazy. So, we are struggling with, like post pandemic with increased traffic and related to that, we don't have sensors, but we'll put sensing networks. So we'll measure pollution and noise, which comes with it. But it's, it's not just about this, it's also about kind of an experience of the city itself. So, when you have cars everywhere you can't really enjoy the streets. So, we've introduced three years ago a parking policy in the city, which should kind of clean up the streets and regular make you think about if you want to come to the city, in your own car. In places where it has been introduced, it's kind of cleaned up the streets and, and freed up parking spaces. So, it's a, it's a huge opportunity for the city to basically make kind of clean up the street would be the, the easiest way to say it. So, we are supporting that with different digital tools. We are introducing a city parking application to make it easy for users to actually park. We've been talking to a couple of companies about car sharing. There has not been any car sharing yet, but it might be an opportunity for some people to get rid of the second car. What we were looking at and what this administration is very strong on is active mobility, I would say. So you've started to build more and more cycling routes, so they're more connected and you feel safe to cycle, but also we are looking at so we are now in a process of getting new data for our traffic plan so we can start better planning, which streets could be one-way streets, which streets could be maybe closed down or redirected. So basically, it's more comfortable for you to walk and cycle in the city center or use public transport and use your own car. That's a strategy. Lots of western European cities done 10, 15 years ago, but we are catching up. And so we are, we try to base this on, on data. So there's a huge collaboration with the traffic department as, and the strategy office to collect data from different sources and we, we are introduced breast SLA id, which is a portal for digital services, and we want to use that for collecting feedback from residents so we can do traffic surveys in there as well, so we don't have to do them the old way with paper and knocking on people's doors. So that's very broadly what we are trying to look at.

Justina: This is very exciting. Do you have a specific series in Europe that you look up to? Like specifically some, some cities that have implemented some citywide decisions, or let's say city center wide decisions that you would be?

Petra: I think it's, it's more of, so we've started collaboration with Bloomberg associates, which is a non-profit, consultancy, consisting of people who worked with, Bloomberg, mayor Bloomberg when he was a mayor. So, Janet works with our traffic team, and she's kind of advising on the traffic islands and you know, how to do the changes in public space, but also on design of the system. So, so she's been, and her team has been a great help and they worked with Paris with Bogota with other huge cities around the world. And we have kind of working relations Paris, with Amsterdam. So, we try to kind of get inspiration from them and get some advice. But it's also very specific for, for bras, lava in, in certain ways, because the hardest part here is behavioral change. I guess that's everywhere. When I read books from, the Netherlands, they also had some issues with it, but that's the thing we need to work on the most, like participation with residents.

Justina: Yeah. This is something I also touch upon in the report is, is how drivers see the streets and the city from their own perspective. And it's difficult to imagine that, for example, if they lose, and this a very random, not related to Slovakia example about if they, if they lose a lane or lane's direction is changed, a street's direction is changed, that does not mean that it's going to impact them as much as they think because providing people with more modes of transport means also that less people on the street in cars, which means even better driving experience for those who do choose to take a car, right? Because they're not stuck in such a huge traffic jam.

Petra: Yes. I mean, there are quite a big traffic jams now because a lot of people started using their cars and driving into the city. So, we went to the pre pandemic numbers of couple months ago, and the numbers of cars are still increasing, but it's also kind of showing the perspective of others. So, we have another project called City for Kids, which basically looks at the perspective of children when they walk to school. And it's for parents as well to, to kind of see, like your child can see through park cars. So, and it's a concept of school streets which has been introduced in Amsterdam and Barcelona. So basically, it's just in pilot phase, but the idea is to close off streets for traffic when school is in session and redesigning the space around the school so it's safer for kids to move around.

Justina: So that sounds Fantastic as someone with a small child who will have to go to school at some point on his own, I completely, I very much relate to this. I think, I think it's a, it's a fantastic initiative for sure.

Petra: It's something that is, I think it's been introduced in Tiana actually, which is very interesting. And it's, it works in, I think it works in Paris, Barcelona and Amsterdam or across the Netherlands. And you can increase you can see increased safety and air quality and all the other indicators that are crucial for health in the city. And also, kids feel more empowered, which is great.

Justina: Yeah, yeah. True. They can go to school on their own and come back on their own, and they, yeah.

Petra: Yeah, it's true. Yeah.

Justina: Great. You also briefly mentioned pandemic and pre pandemic numbers. I, my colleagues, my, our analysts have collected some information on the public transport of the people carried in the public transport. Well, since the pandemic started and there was a, a clear decrease in people using public transport. Right. So, you would say all these people shifted to working from home or it's traveling by cars.

Petra: So, I think it's, it was mostly we had pretty tough lockdowns, so the city was very empty and most of the people worked from home. And we saw a spike in cycling, not, not very big, but I mean, if 2% double to 4%, you know, that's kind of doubling the, the numbers so that that can be seen. So, the public transports, dropped 80%, which was very significant. And it was, it's still a very hard time for the transport authority to deal with the, the money missing from it. And yeah, we didn't have much car traffic. I mean, there was car traffic obviously, but not as much as bad.

Justina: Yeah. Similarly in the building, I believe we had very similar experience. We're, I think we're quite close, culturally. So yes, similar things. I hit similarly, both cities. Also, interesting point, and you don't have answer I saw there was a slightly decreased, buses or bus routes, public transport routes basically as well since the beginning of pandemic. So just wanted to say if you've, if it's basically it's to validate this information with you as well, let me find what I have.

Petra: Yes. So, because some of the buses were dedicated to kind of taking people to work, they were cut out. So it was, so I think they were adjusting based on the needs of, and the current situation. So, some were cut out, but then they were introduced again. So, there were some changes. Now, again, just because of the inflation and the lower income for the for the city and the transport authority, but they're still trying to keep the accessibility of public transport. So, for example, you have a tram which goes every four minutes, which is like a metro, basically.

Justina: Yeah, yeah. True. And in general talking about the pandemic, do you see any interesting lessons like positive as well that you as a city learned which would help, like combat long-term effects, or in case a pandemic comes up, right. And we are all hoping that it doesn't, do you as a city feel way more prepared than when you were then and you were like, we can do this next time much better?

Petra: I think we've, we got, a little bit scared. So, you see Paris and other cities just close off streets. And now I think we would be more adventurous to do that. More ready to, I guess allow people to like, enjoy the city more or make changes in public spaces, which could be, piloted and if successful, then turn permanent. So, the same way they do it, they did it in New York, for example, with the Plaza. So, it was an experiment for half a year, and if it worked for the local community, then it was, it stayed. So, I think we would be more open to these types of experiments now.

Justina: Great. I have a few more questions for this interview. And look at, we took some interviews from the startups and some other people and some of them were staying in a vis in a very positive light, of course, that some of the innovation potential for the urban mobility does rely on city and city's willingness to work together with startups. And improve the infrastructures. For example, I had this great example shared by Bolt, how they quickly had to add more scooters and how they, well, collaborated with the city and city provided parking spaces and provided the infrastructure for parking, right? So do you agree with this point that city needs to work closely. Provide this infrastructure for new innovations to come, to come on board?

Petra: It's not just urban mobility, it's innovation in general. The city is, is there to set rules to set, I would call it set the table. So, we make the policies, so it's clear for everyone. The rules are equal to everyone, so we don't prefer one or the other. So, for example, with the scooters when they came, we introduced rules saying like, you have to you know, park in certain areas, you have to go slow in the city center and so on. And if that didn't happen, then you know, we would start to talk to the company, but it's not like one company has a better condition than the other, because that's not fair. And we are here to serve the public. And the public is also startups. One thing that helps also bring new services for residents. So, we need to be SI don't want to call it supportive but provide an environment would be the best case. And al also, if we consider some innovation relevant, then open doors. Because one thing is providing space or making rules, another is enabling. And honestly, we try, but I don't think we're as good as we want to be in this. There's still room for improvement, but at least there's willingness to do so.

Justina: Yeah, it definitely seemed to me as well. And considering other innovations that might come up or startups that are just speaking off, what do you think new startups, new innovations, you as a city innovation officer what do you think is the kind of a coolest or the thing that you would mostly expect new, new innovations to bring? Either as an urban mobility solution or just a specific way or any other type of innovation that you think it's still missing?

Petra: I think I would twist the question in a different direction.

Justina: Go Ahead.

Petra: And answer it in a way that, I think it's important for startups or anyone bringing innovation to listen to the city. So, I met a lot of companies that didn't listen to the city and the city needs. because the city is like a corporation. It's, it's a big organization that needs a partner that we, when we decide to work together, you know, we need someone who's reliable who can deliver on promises and so on. Also, kind of setting boundaries because the city can swallow you really easily. So, if you want to pilot something, then stick to piloting something. And for us, I mean, mobility, I think the big opportunity, but that city should be driven, drive that is mobility as a service, because those, like when once you make it really seamless, like when you're ordering food or a taxi, but with all your mobility options, then people will not feel the need to own things or in much lesser extent than when you have a, a car which you can rent really easily around your house whenever you need it, when you can get to the city center by a train which is comfortable in a couple of minutes, use a bike whenever you need it and drop it off wherever you want. I mean, in designated spaces, but you don't have to worry about a service and, you know, do I have to lock it? What if someone steals it? So, parts of it have been done really well with bike sharing and with public transport. But connecting these together into one kind of experience for, for a person, because we are now looking for experiences, it's not a need. I mean, you can go and use any mode of transport. You're looking for an experience for something that's pleasurable, that is comfortable for you and that's something that's, is a huge opportunity.

Justina: Yeah, I completely agree. Do you have any other dream for the city that you see? Any other things upcoming in development? There has been a lot of discussions about metro, right? As well. Do yourself have any dream as a city and you yourself, it can be two separates, of course.

Petra: I think for, for the city it's, it's realizing the city can be more for people than less for cars and being brave enough to make it a city for people rather than city for cars. And there has been steps taken already, but making it really, like when you look at Paris, like how they close the, the quay next to the river, that, that type of things. Like really showing people you are the city. And for me I guess to have an enjoyable time in the city. Or like, whenever I travel, I like to explore the city. So, so when you walk, you kind of explore the city. So have more opportunities to kind of explore places and having streets. They're inviting, they're comfortable. And it's not just about mobility, it's also about design and accessibility of different services. So, it all kind of ties together in the experience I was mentioning before. So, cities', experiences that will, will make you want to come back and stay and explore more.

Justina: Yeah, thanks so much. One thing we haven't touched, and before I completely forget, is mobility for goods and potential and, and services, right? Instead of people. Do you have any thoughts on how that is done? What are the challenges? What could be done better here?

Petra: So, Bratislava has 17 city districts, and you can see this the most, I guess with the city center where you have kind of checked entrance. So, it's pedestrian zone. You can't just come in with your car, but at some time during the day, it turns into a highway because there are all these delivery trucks coming in and out, delivering things, driving through the pedestrian zone really fast. And that's also a big opportunity. I know that it would require a bit of a change because it's not going to be a huge truck. It can be an electric truck, but that's not a solution. I think you need something more human and that would require change in how you deliver goods when you deliver goods to different companies and restaurants. And also it'll be more expensive at certain point, I would say, but that's also an opportunity. So, the opportunity for the city to change the policy so big trucks are not allowed. And then, you know, the business will come up with different solutions and that they can be piloted. So that's also an opportunity for collaboration and business opportunities. And when we think about the rest, so when parking policy has been introduced, they're the streets are redesigned as well. So, at the beginning of the street, you have this line, which allows you to stop for up to 15 minutes. So, they can be used for dropping ups, drop offs and pickups for taxis and for delivery trucks. So that's also a nice way. So, you, you as a car do not block, a cycle, lane a road, or you don't park on a sideways. So, kind of cleaning up the street with the proper design could also help with safety, but also comfort for everyone.

Justina: Okay. Interesting. Great. So, I think the most important questions, maybe the most important questions in my list are kind a done. Maybe you have more suggestions to academia to other governments like your own suggestions, how they should work towards achieving smart and sustainable urban mobility. How they could collaborate more. I know you did mention talking to the city to actually work together and hearing what the city needs. Is there any other advice you could give to startups and innovators or academia?

Petra: I think, yeah, that defining the problems together with the stakeholders. So, it, it just, it doesn't need to be the city. It can be also the residents or the businesses that are affected by this. So basically just asking what is the problem and solving the right problem because a lot of the times we are solving problems that are not the right problems and we realize it's lately and I think I would aim this towards the city, so be a little bit more brave and courageous to test out things. I mean, there are policy frameworks for that. So just introducing a policy framework and allowing and opening up because that's really important. If you don't, then someone else will and you'll lose out basically.

Justina: Great. Anything else you would like to share about urban mobility, about the city with me? Or if you do come up with something later, you can always drop me an email as well.

Petra: I'm very slow. Rider. I think I've mentioned all the key points. I think mass will be a, a huge opportunity. And also, kind of, everyone's talking about EVs, but those are still cars. So, it's more about kind of a shift in usage that's really important to kind of realize.

Justyna: Yeah. Great. Thank you so much, Petra. It's been, it's been a, such a huge pleasure to meet you. It was really interesting to listen to your reviews and your stories, so thank you so much. I really appreciate it. I will check this, the transcript and mention the key points mention. It's, it's very nice how they also work together with the other sections of the report we, we have written. And it all kind of makes sense and falls nicely in its own places. Yeah.

Petra: When you have it ready and if it's public, I'd love to read it.

Justina: Definitely, definitely. We'll, we'll share it with you hopefully before it's published. So, in case you have any comments, or I misunderstood any of the ideas that, that they can be adapted and make sure that you're happy with it as well.

Petra: Okay, great. Thank you.

Justina: Thank you so much, Petra. Enjoy your slowing down and hope your hand heals quickly.

Petra: Thank you very much.

Justina: Thank you.

Appendix 4: Interview with Peter Mesarč

Justina: So, you can now start, I talked for a lot of time before.

Peter: What exactly I should start with, let me know please. Like, let's kick you off. Let's kick you over with some, some single question by the way I made, because I do think that you and everyone who will be reading the, the report is very curious mainly about the data. And we as a company, what we are gathering, like huge load of data. And moreover, we are making a lot of case studies with the international partners or internally in the company.

So, I have like, I have prepared like bunch of data on each of the questions, which were, which were placed into the report. So, like the first question, basically was like what we in the vault, understand under the two magic words, urban mobility. First of all, like we need to understand that urban mobility from our perspective should solve like three main issues, which we see in the cities in the urban environment.

First is air pollution. Second is, parking slash idle vehicles on the streets or at the households. And the third one is the traffic jams. When we will support it by the data, we see that car transport is responsible for more than 20% of the world's carbon dioxide emissions, which is like huge loads of carbon dioxide. When we are speaking about the idle time of the vehicles is well known that 95% of the time vehicles is standing in the garage or somewhere in the parking spot, only an actual utilization of the car is only 5%.

And in those 5% still cars are able to create huge traffic jams. And this is something which urban mobility needs to solve. And urban mobility is responsible for designing very smooth environment for people to transport inside the city, basically.

Justina: Yeah. This is, this is very, very interesting. I did not know about the 95% at all times. This is very interesting. Now, thinking back, we ourselves have a car, well, my husband has a car and yes, he only uses it to bring child to day-care and back.

Peter: Me as well. I am an, I'm the proud, ironically said, I'm the proud owner of the private car as well. This is the, maybe the next question should be, what do we need to do to force people to give up on the car. Because if I will just publicly say that, okay, 95% idle, 20%, carbon dioxide emissions, traffic jams, accidents, yada, it's not enough for me to convince you to drop off the car. So, what it needs to be, and I think it was like question number, I will tell you.

Justina: I have it open here as well.

Peter: It was question number four.

Justina: Yes

Peter: For convincing people to drop off privately owned cars, we need to understand that on streets there, there are like two separate environments which can create huge synergy. First is public transport system. Second is alternative means of transport. Right now, we see a huge and very positive trend from the cities because cities are really the main actor here when it comes to some change and progression that they're developing in Slovakia, the public transport system very well. And they are really pushing it to have it more efficient, more friendly towards green environment and more friendly diverse people. And then we have automatic means of transport, what we can offer to people. We can offer basically three modes of transport for short journeys, mid journeys, and long journeys. Here in bolt for short journeys, its micro mobility, scooters, e-bikes for mid trips, it's ride hailing. Basically, you can, you, you, you can, run taxi. And the third is a bull drive, which is car sharing car sharing business model. And only if public and private sector will offer great synergy and very attractive and very affordable offer towards the citizens, then the trend of convincing people to drop off the car is rapidly increasing. So this is the, this is the key to create a synergy between public transport system and a

private sector create a good offer, good value proposition for people to convince them that, okay, you don't need to have a car or if, so you don't need to have two cars in one household. Which is also the case for people not only in Slovakia, like globally in Europe.

Justina: I have a follow up question actually. So, you said with the right incentives and there are several ways cities can approach this. So, there are actual incentives or there could be actual like punishments for not, for not paying, right. Increasing in increasing the paid parking zones and then taxes and everything else. Right. And there are different countries who went different ways, not necessarily to solve urban mobility, but let's say Belgium and especially Brussels, Antwerp earlier, those zero emission zones, right?

Where you cannot enter the city with a car that's of this age. Right. And, and if Slovak is improving, its public transport, maybe also intercity transport, maybe not only in British, but maybe in other areas as well. And you know much more from living there, which path you, yourself think it would like? Is it a combination of both looking at people's habits as well? Because you probably see a bit more of how people are using everything in different countries as well. Right.

Peter: This is the never-ending story for Slovakia because everyone, I see great examples of the Belgium or the Netherland where you have pipelines everywhere and like single car is very rare to seek the city center. But we need to understand that those countries high developed country in terms of urban mobility, it, it hasn't happened from night today. It's a long journey. It is a long process, which has started like 50, 60, 70, a hundred years ago. And the most important thing is to decide which part we want to go. I do believe that some kind of combination of two of these two models is very, very good and suitable and sustainable for the city, because simply in the short term, we will not be able to ban cars in the city. In the short term, we'll be able to build the infrastructure which will support alternative means. And we see that here in Slovakia. The bus lanes, the taxi lanes can be also used by the cyclists, by the e scooters, by the e-bikes. So, in Slovakia, especially when we are solving the infrastructural problem, we are creating the space for those two types, which can substitute privately owned cars, public transport, and automatic means. So I do believe in short term, the key message should be create more and more kilometers of infrastructure inside the city, and people will adapt for sure, because then the tendency to switch the car will be even bigger because we will be able to show more and more the benefits of alternative means of transport.

Justina: And they look two streets and two pathways that, and paths they need to cover from this very from their own point of view, right? That if the streets are, are made more narrow, that means they will spend more time in the street, like in traffic temps, which is, some people actually have a very different approach that if you provide comfortable ways for people to travel outside of the car, people will choose. Some people will choose not to travel in the car, which will free up space on the

street for those people who still want to take the car. So, what is your approach? Because talking about infrastructure, it's also like governmental decisions, right?

Peter: It's only the governmental decision. Yeah. We, we as a, we as a private, business companies, we, we, we cannot impact the change like directly. We can support it with that. We can tell people and what we should do. And I think this is an open call for all of the operators. We must share data with the cities. It's our responsibility because we cannot be simply allistic calling for more infrastructure without giving someone the data. Very important to understand from my perspective that if our perception is to, on this street, to build one kilometer of cycling infrastructure, it needs to be supported with the data because otherwise it'll be just blind kilometer of cycling infrastructure. So together with the city, we must support their decision by our data because we have huge amount of connections between some hardware, meaning scooter and peak, and, and the, and the user or the taxi driver and the user or the car sharing hardware end user and together to, to create more infrastructure. Speaking about controversy of when, when creating something, this is very similar when you are introducing a new kind of service in, in into environment, whether it is car sharing, which is like brand new thing in Europe, like the platform capturing, like the capturing companies have been there for years and years at airports and everywhere. But like the platform capturing or the scooters two, three years ago people are always against new things. The mayor of Bratislava simply said that people will adapt because it was needed. It was designed based on data. It was pre-approved and approved by the traffic engineers, transport engineers, safety engineers. So, it's absolutely okay to have such bike lanes or lanes for alternative means of transport in the city, even in a very big grand area because it doesn't make sense. I mean we are standing at the point where we need to decide we have a traffic jam here. How can we dilute the traffic jam by adding one more line? No, we cannot because there is a pavement. So, we need to reduce the number of cars then, because otherwise there will be still the congestion. Yeah.

Justina: And this is,

Peter: This is, this is one of the ways how we, how we should do it. I think, and I'm very supporting this decision, honestly. And each and every decision when someone based on the data, based on the arguments from the transport engineers and safety engineers or someone say, okay, here needs to be 1, 2, 3, 5 kilometers of the cycling lane. Cycling lane. I'm supporting it always. It's good for the city. Short term controversy, long term only benefits.

Justina: Great. And in terms of you yourself or Bolt in general, do you see any challenges that you specifically are facing in Slovakia that you believe should be taken into consideration by someone? Or do you want to openly tell them? Right. The challenges that you would like to bring into attention of anyone reading the report. It can also be challenges that you want not to be named as your challenges, but the challenges that you think I should look deeper into with other stakeholders, for example, as well.

Peter: I understand, I understand simply challenges or, or barriers, let's say.

Justina: Yes.

Peter: Like for, for better development from the company perspective, again, we have like three main streams of the transport, short made walk. But I think one by one for the short trips, meaning micro mobility, it's for sure missing infrastructure. That's the, that's the thing because like otherwise, regulation on the central level in Slovakia is more or less okay necessarily doesn't need to be strictly touched or deeply, deeply touched. Then micro mobility itself needs to be in very close touch with the cities because cities, they're the main actor of the, of the game. They need to set up the rules, how, how, what is their vision on the micro mobility in the city. And then they need to align with the with the operators. So, all in all, we will end up again in the missing infrastructure for short trips, for mid trips, meaning ride handing and the taxi services. I do think that the whole Europe is standing right now before very important decision whether to make the regulation more flexible or not, because we see that this stream of ride handing or renting a taxi is somewhere in the middle between dropping the car and having a car because you're still sort of driving a car or driving in the car without having it. So, it's very comfortable. Your needs are satisfied, you can travel by your car and it's on demand. It's good. You can, you can call it whenever you want. So, I think that the, the barrier for ride railing Slovakia, it's the flexibility of the regulatory, a government simply, and then for the long trips, which is car sharing, right now, it's very tough for operators to step or launch the cities. So again, the regulation, but also the local administration is not the barrier. But the thing which is challenging when you're trying to enter the market and when you're trying to run this mean of, of transport simply. And again, once you, you, you are dealing with the cars itself as a hardware in terms of car sharing you need to have places for parking, but how can you have places for parking when there is like so many already on the cars everywhere, and then there's a parking policy which every city has prepared. So, I do believe that for this sector, it's mainly like local authorities and local regulation is very important and very challenging for us. Is it understandable?

Justina: Yes, it is. It is. And I, and, and I completely understand and I'm thinking about it as well. I'm also drawing a bit of my own experience. I lived in Brussels for four years before I moved back to Pennsylvania. Where we actually did not own a car there, because first of all, it doesn't make sense to own a car in Brussels in general. And this is something that really bugs my mind because it really, it doesn't make sense to own a car in Brussels. It's never quicker by a car unless you're going into an area that has no accessible, no easy public transfer from your area. Right. Too many connections, uncomfortable travel time, right. While Belgium is still quite car centric country. And we did use the shared infrastructure. Basically, we did use them.

Peter: Or just look at the, just look at the product. I can compare it with the product is like very well public transport system. And also I do not remember the country, but if you give me one second, I'll tell sure where we made the study because we conducted the, the research with Norwegian Institute for Transport and economics in 10 European cities where we offer to people that they can use scooter or any other like small hardware if they are traveling a journey up to three kilometers. And the answer was that 60% would use it. Yeah. They were convinced that, okay, if it will be available, if it will be affordable, if it will be close to myself, I will do it. And they still see that there is like huge volume, balloon of trips under three kilometers, which is done by car. And this is something. And speaking about Prague, Prague has very well-developed infrastructure network of the public transport. So, the need of owning a car there is really like, not, not, place simply. And the reason why is what I, what I said at the beginning, there is like huge chance for having a synergy between very well developed or, or not good by mobility, but very well-developed public transport system. And on top is connected the share mobility, assets, scooters, banks, cars, whatever. So, you can simply go from your house, jump on a, on a train, go for four stops, then you know, there will be scooter at the stop. Drive for five minutes to your work park, you there done, instead of spending 25 minutes in the car in a, in the refuge. And this is like close cooperation between operators and city is like, it's, is a must the priority number one.

Justina: Is it a city or can it be done by like city mapper and similar organizations or vault itself, right? When you, if you integrate it, let's say live public transport timetables, and then you see, hey, if you take this bus for four stops, you can get into our ball drive.

Peter: I think it right? That here we need to be more organized and more in touch with cities. Like very honestly, because the ultimate goal of each and every operator is to become like sort of super app. So yeah, we just, we will just put point A, point B, all connections, all options will appear in the application, but like the necessary part is public transport. Then when we are switching the road, and I will be talking in behind the city, they'll tell us that, okay, well we need to know the alternative means of transport, which can be contributed to the journeys. So, we just need to sit together. Even it can be city, it can be some external organization, which is partnering with the city, like which who is gathering data, who is doing the expertise in the field. It seems like we need to work together on the integrations so the people will have a comfort, we'll have a good offer, and then it can work simply.

Justina: Yeah. I definitely agree on that and in Slovak in general, when we talk about public transport and you talk about Vault as well are you mainly focusing on KSA and Bratislava in general, or do you see like other regions where other.

Peter: In both? We are doing our best to basically not, not making any like, huge differences across the cities. Right now, we are present in every regional city. Also is for ride. Inhaling is eight cities for scooters right now, only five. But the next year, hopefully we will be able to expand back, which previous years

we were operating there. So, we are trying to support medically every city, but we are operating, not focusing on non-Islam because we clearly see on the data.

Attraction is similar everywhere, and that is only multiplied by the size of the city, but attraction with demand and the needs of the demand, it's split evenly across the republic. And the same thing for Czech Republic, basically, yes, we know that Prague will generate more connections because more people is living in there, but we, when we are going for the ratio, it'll be very splitted evenly across all of the cities because the need for the transport is everywhere and the which they're battling with.

Justina: Okay, good. Because I think one thing we are avoiding, and, and I personally am avoiding when I'm working on this, is I don't want to make a report on SLA and k when we are, when we are talking about whole Slovakia. Right. So, insights into other, other towns or just like insights that work for other towns are also very important because it's just very easy to talk about b lava and the whole report.

Peter: I, I mean this is, this is a good question. Honestly, because Slovakia and Czech Republic are very centralized countries, double digit percentage of people is working either in Prague or in Slovakia, like two ends of the country, but they're living somewhere else and they're spending weekend there, or maybe they're working from, from home there. And once they see how the transport is looking in those cities, what is the reason to not have the similar setup in their city? I mean, there is like no reason to not have it when it's working, and it's can, it can, it can leverage the, the cities, like regardless of the size. And that's what we are doing. We're supporting like each and every city where there is need. Three years ago, with scooters, with micro mobility, cities were reaching to us with the request of launching the service, and we have made it at that point. Then unfortunately, some unpredictable events happened, and we were forced to for one year to shut down the operations, but next year we should be back. But really, I mean, data, that's, it's really suitable and very important part of the, the environment in those cities. People not, not adapt. People really want it, not because it's like very attractive to drive on a scooter or to order a taxi because it's very useful. It's saving there, it's saving their, their funds, which they can spend anywhere else.

Justina: Yeah. True. Great. One of the just a few last questions. So, I would like to talk a bit about a covid pandemic and that is a very big topic, I think when we talk about urban mobility because it affects public transport. And we have looked at statistics, let's say public transport passengers carried each year, right? And we, we, we, we saw a very steady increase in the yearly routes and passengers carried in Slovakia, but in 2020, well, you in 2021, you know, what happened. Right. How did that affect you and how did that affect your operation? And I know probably wasn't easy as well as people shifted from maybe midterm solutions to this mid journey solutions, right? To kind of avoid being in the same car with the driver, or you didn't observe that.

Peter: Yeah. Okay. For Slovakia mainly Slovakia was one of the, I think two or three countries worldwide who banned taxi, taxi service.

Justina: Wow.

Peter: I mean, like fully, we just, I mean, I would open record. We had received a letter from the national Council, from the Ministry of Transport that all taxi dispatch, regardless of whether it is like classical taxi dispatch or digital taxi dispatch, will be at the end of this day, shut down. So, for six weeks in Slovakia, there was no taxi service in the first wave of Covid first quarter of 2020. Which means that we dropped by a hundred percent in Slovakia because, there was no rights globally as a company, we dropped by 85% in right Haing field.

Justina: Wow.

Peter: What we have done internally, and this is like, this can be present as a real success story of both, we were able to redistribute people from departments to other very fresh, very small and very new products and department like Bold food and scooters to very quickly launch the service. And we were able, basically with the scooters to launch 16 countries in four months, because we literally felt the need to give the people other option how to transport themselves somewhere. So, this was like great success after six weeks, bound was removed, and very slowly we recovered, but yes, we saw unfortunately a hundred percent right drop. However, yes, the curve of getting back the demand was not so steep. It was very, very slowly. But we were able to recover pretty fastly because then in the summer however, what was the side effect of covid, it doesn't ruin the businesses, but also it creates a new opportunity as scooters. And what it has shown was that all of a sudden people need scooters, e-bikes, bikes, whatever, just to transport on the pressure. Well, great. Everyone will be helping. So, and cities wanted it as well. So, they were requesting launch the service. So, we launched it, all operators launched it, like the, the curve was like really steep. And then once years later, we found out that, okay, this was so fast and cities were not able, which is absolutely natural to adapt because it was like really seven days. And just imagine that thousands of vehicles appeared on the streets, and like seven days before, nothing like that was even existing. Like zero parking spots, zero, nothing. All of a sudden, huge bunch of scooters, huge bunch of new vehicles in the street. And that was a huge challenge for cities. And right now, we're two years, three years later, we are solving this issue, not issue challenge, simply that's okay, vehicles appeared right now, we need to feed them into environment from our perspective, COVID fastened the business, like make, make, make, make it a bit quicker in terms of like launch and everything, but also reveals the weakness of the infrastructure, which right now it's our responsibility to help to solve.

Justina: And is Citi helping you? Are helping you solve.

Peter: That? Yeah. Yeah. I mean, like for Slovakia, I can say that cities are very engaged. They're very happy that we are offering the services, and we are helping each other, basically how we can data sharing from our side, they're doing their best to create infrastructure in terms of parking lines, new rules and, and everything. So, I can say that in Slovakia, we are satisfied with the level of cooperation between operators in terms of micro mobility and city municipalities.

Justina: Great. And are you creating any internal guidelines about how if the next pandemic would've come, right? A new one again as Covid was, maybe we were all very scared on wave one, but wave one was nothing compared to the subsequent waves of the number of cases, right? Yes. Are you thinking about what you would do you have an opinion of what, what would be the next step? The next pandemic hits? Do we, do you strengthen existing offerings? Do you already have like, oh, we should also do this.

Peter: I mean, during the pandemic, and if in that, let's imagine that it'll be, again, covid, nothing more serious, like Covid was very serious, but the restrictions will be basically the same and the conditions of the, of the illness will be the, will be the same. Then yes, we, to, like globally, we found out also the safer way how to transport people in the taxi. So, we will be able to not drop the business so much because we were able to, I know, install the, the plastic wall into the taxi. So, there will be no contact between passenger and the driver itself, and also the driver very instructed. They need to, they need to basically decontaminate the premises after each passenger have some rest after, after each ride. So, we know the rules, we know what has been working. We are here to help the government as well with the data. Again, because we gathered everything during the second, third, fourth, and, and other waves of Covid taxi was not banned. So that's in terms of taxi, in terms of micro mobility, I guess we can keep status quo. We know that we need to like, again, saturate the, the, the hotpots make it even more available for people. What is more important, and this was like pretty good case from COA actually, where to, because basically we were supporting the covid testing on streets. So, the, the pharmacy workers were driving on scooters to deliver the results through quicker, faster in a, in a more in a more suited way and sustainable way. So, for sure, we will be here to, to help the ecosystem. And then as well, we have the whole food here which can deliver you not only not only the, the meals from the restaurant, but also the groceries. So, I do believe that we are well prepared. We can for sure support the government with the right decisions because we were under some particular restrictions, and this was the impact. And we have it measured. We have the impact on this metric, this metric, this metric. We can tell them, okay, you restricted something, but people found a way and it worked. So why to restrict it again? So, and I guess that we'll be, if such a case or such a situation will happen, unfortunately not, we will be prepared with everything. And I, I think that the lesson has been learned really.

Justina: Great. So, my last serious question is maybe if you are open to share what's next for you? What's next for Vault? In general? In general, or in Slovakia? What are your, any short-term, long-term, long-term plans?

Peter: At least for Slovakia I can share for sure globally. I'm not comment it. But for Slovakia, what is important for 2024 we want to strengthen not our position but strengthen the usage of our services in the cities. For sure. We don't want to, as you, as you mentioned, we don't want to focus only on the tier one cities, but also growing also deeper, deeper to the, to the regions. We want to have the best offer for the customers. That's very important for us. And from the perspective of micro mobility particularly, we want to come back to the cities which were shut down before. So we will be, again, operating in all over the regional cities, and we will be offering affordable and very sustainable way of commuting within the city. That's the priority number one for 2024 to be bank and to serve the people.

Justina: Thank you. This is, this is great and just to close it off, if you have any fun stats or any fun data or any general fun facts, because sometimes it can be really fun, I am adding several of those. Did, you know, text box throughout the report and you know, something about what I have now, I can actually mention very briefly.

Peter: We, we, we have like fun facts, little bits 25,000 or kilometer of spaghetti has been delivered by a bold food

Justina: 25,000 kilometers, kilometers. Yeah. So, we are, I am including these kinds of interesting facts about Bratislava, I believe being the first city in Europe to have a tramway, because I am touching on public transport as well when talking about urban mobility. And then we have this interesting story, which I'm still unsure where to include because it needs to fit for the topic that, the first woman who, women who drove was it the bus? I believe? Like people were refusing to get in because they were so scared. And that was the first woman in Europe. It's just like a fun fact about this, about this one. I'm not sure where to include it. I was very surprised when our analysts basically dug this out, but yes, but I'm collecting this also interesting facts to go with the report, interesting statistics that maybe people do not know. So, if you come up with something really fun send it my way and I would be really happy to check it out and attribute of course as, as, as needed.

Peter: Yeah. Okay. Like, not the, not the single issue what I can do, I can send you like very rough overview of the answers for the, for the question send me, you'll have it also in, in a written way. There is some amount of data as well. And also, I'll ask our PR agency because they're holding all the fun facts. So, I will send it to you. I don't know, like what is the, the good timeline for you? What, what, what, what works for you? Seven days, five days tomorrow, today

Justina: Works. All of these numbers work for me. Always

Peter: Agree on one week.

Justina: Yes. Perfect. Great. So, thank you so much. It's been an immense pleasure, everything you shared has been extremely interesting to me and I'm very happy that we got to talk and I'm very excited now to deep, to dive deep into what you've discussed and to kind of start mapping it out and then start writing about it. So, I'm really excited, really thankful for your time.

Peter: Likewise. It was a great pleasure and great honor.

Justina: Thank you so much Peter, and I hope to see you soon. And I will of course reach out to you once I have drafted the sections, drafted the report for your overview before it's published anywhere.

Peter: Thank you so much thank you so much

Justina: Thank you so much Peter.

Peter: Thanks rest of the day and weekend is coming even though it's Wednesday, so have a lovely weekend as well.

Justina: Thank you. You are too. Bye.

Peter: Thank you so much. Bye.

Additional Information Sources on Urban Mobility:

IMHD.SK: <https://imhd.sk/ba>

Slovak Spectator article on urban mobility: <https://spectator.sme.sk/c/23190425/slovakia-urban-smart-mobility.html>

Study on the evolution of urban mobility: The interplay of academic and policy perspectives: <https://www.sciencedirect.com/science/article/pii/S038611121400017X>

Study on smart transportation in the conditions of the cities in Slovakia: <https://www.ejosdr.com/download/smart-transport-in-the-conditions-of-the-cities-in-the-slovak-republic-13070.pdf>

Suitability of Travel Modes: <https://transportgeography.org/contents/chapter8/urban-mobility/suitability-of-travel-modes/>

SWOT analysis of Slovak public transportation: <https://www1.pluska.sk/regiony/zapadne-slovensko/fakty-zaujímavosti-verejnej-doprave-takto-sme-cestovali-minulom-roku/4>

Digital platforms in taxi services in Slovakia: <https://monitoringmsp.sk/2020/04/06/digitalne-platformy-v-taxisluzbach-na-slovensku/>

Publication on taxicabs in the system of public urban transportation with regard on the inter-war Bratislava: https://www.upjs.sk/public/media/16671/MaD_2017_1_Jancura.pdf

New urban models for more sustainable, liveable and healthier cities post COVID-19: <https://www.sciencedirect.com/science/article/pii/S016041202100475X>

Creating Liveable Cities through CAR-LITE URBAN MOBILITY: <https://www.clc.gov.sg/docs/default-source/books/carlite-urban-mobility-finalreport.pdf>

Portland: American outlier: <https://www.citnature.org/city-livability-blog/portland-american-outlier>

Cologne mobility transition: <https://www.polis-mobility.com/magazine/articles/mobility-transition-made-in-cologne.php>

Sustainable and smart mobility in Japan: <https://labverantwoordemobiliteit.nl/wp-content/uploads/2021/12/SUSTAINABLE-AND-SMART-MOBILITY-IN-JAPAN-DEF-REPORT.pdf>

Rebooting Japan's mobility market: <https://www.mckinsey.com/~media/McKinsey/Industries/Automotive%20and%20Assembly/>

[Our%20Insights/Rebooting%20Japans%20mobility%20market/Rebooting-Japans-mobility-market.ashx](https://www.ourinsights.eu/insights/Rebooting%20Japans%20mobility%20market/Rebooting-Japans-mobility-market.ashx)

The Parliament magazine article on city design:

<https://www.theparliamentmagazine.eu/news/article/car-centric-urban-design-pedestrian-cycle-friendly-planning>

Zilina tragic congestion: <https://www.startitup.sk/cestujuci-vystupuju-z-autobusu-uprostred-cesty-v-ziline-je-sialena-zapcha/>

Kosice and its traffic collapse: <https://www.kosiceonline.sk/dopravny-kolaps-v-kosiciach-mesto-caka-na-obchvat>

Traffic in Bratislava and around the city borders:

<https://www.bratislavskenoviny.sk/doprava/71688-doprava-v-meste-i-na-jeho-vstupoch-sa-tvorja-kolony>

What adds to traffic congestions in Slovakia: <https://hnonline.sk/auto/servis/96108470-najcastejsie-chyby-vodicov-ktore-prispievaju-k-dopravnym-zapcham-robite-ich-aj-vy>

Presov and traffic congestion due to road repairs:

<https://www.bratislavskenoviny.sk/doprava/71688-doprava-v-meste-i-na-jeho-vstupoch-sa-tvorja-kolony>

Development Trends In Road Passenger Transport And The Covid-19 Pandemic:

<https://www.svetdopravy.sk/trend-vyvoja-v-cestnej-osobnej-doprave-a-pandemia-covid-19/>

