Micromobility Solutions for Sustainable Transportation in Underdeveloped Areas

DOI: 10.37199/o41010115

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Abstract - *Adopting micro mobility solutions offers a possible way to address mobility issues and promote inclusive development in developing regions where traditional transportation infrastructure is frequently insufficient. This study examines the particular dynamics involved in putting micro mobility initiatives into practice in developing countries, looking at the socioeconomic effects, cultural factors, and technology adjustments necessary for a smooth integration. The study looks into how micro mobility can help provide accessible and reasonably priced transportation options, especially for underserved communities that have little access to traditional transit systems. This Paper is especially pertinent to the Prespa Region, which is a transboundary area shared by Greece, Albania, and North Macedonia. There, local mobility and growth have long been hampered by transportation constraints. Accessibility and economic growth are hampered by the area's scattered rural villages, elderly population, and reliance on private automobiles. However, Prespa's thriving ecotourism industry and abundant natural surroundings present significant opportunities for sustainable mobility projects. In addition to lessening environmental effects, using micromobility solutions here could improve community cohesion, boost tourism, and foster a more environmentally conscious sense of place.*

The study examines how shared bicycles, electric scooters, and other micro-transport options help people in developing countries feel more connected, have better livelihoods, and travel less distance by using case studies and empirical data.

Furthermore, the study explores the difficulties in designing and implementing micro mobility solutions in locations with limited resources. It goes over how crucial it is to support these cutting-edge transportation systems with sustainable economic models, local empowerment, and community engagement to ensure their long-term viability and acceptance.

In addition, the study looks at how micro mobility might help local economic development by promoting ventures like last-mile delivery services and micro entrepreneurship. Through an analysis of the relationship between micro mobility and social fairness, the study clarifies the ways in which these solutions might enhance community empowerment and general well-being.

In conclusion, by demonstrating the revolutionary potential of micro mobility, this research adds to the conversation on sustainable development in developing nations. Policymakers and stakeholders may design interventions that harness micro mobility to establish resilient, inclusive, and people-centric transportation networks in undeveloped countries by having a thorough grasp of the context-specific obstacles and opportunities.

Keywords - Micro mobility, inclusive development, sustainable, transportations, micro-transport

Introduction

The potential and difficulties of using micromobility solutions as a sustainable form of transportation in developing nations are examined in this scientific study. These areas are rapidly becoming more urbanized, and as a result, there is a growing need for environmentally friendly, economical, and easily accessible transportation options. Micromobility, which includes electric scooters, bicycles, and other

small-scale vehicles, offers a novel way to meet the particular mobility requirements of developing regions. In order to evaluate the viability, significance, and difficulties of putting such solutions into practice, this paper examines recent research, case studies, and active micromobility initiatives. It talks about the possible socio-economic advantages, such as increased environmental sustainability, less traffic jams, and better accessibility.

The paper also explores the technological and infrastructure requirements for the effective implementation of micromobility solutions in developing nations. This research intends to provide insightful analysis and helpful suggestions for stakeholders, policymakers, and urban planners involved in promoting sustainable transportation in developing areas by closely analyzing the opportunities and challenges.

Given the problems caused by poor transportation infrastructure in developing nations and the accelerating rate of urbanization, there is a greater need than ever for innovative and sustainable mobility solutions. In order to satisfy the unique transportation needs of emerging countries, this study investigates the area of micromobility. Compact, frequently electric-powered vehicles like scooters and bicycles are known as micromobility, and they present a viable option for improving accessibility, lessening the impact on the environment, and promoting socioeconomic development. Given the challenges posed by traffic, inadequate public transportation, and deteriorating environmental conditions in these urban centers, incorporating micromobility solutions seems like a sensible and environmentally responsible course of action.

This paper explores the complexities of micromobility's role in promoting sustainable transportation in developing regions through an examination of the literature, case studies, and project analyses. In order to help stakeholders, urban planners, and policymakers find resilient and equitable mobility solutions, this research intends to provide insightful information on the possible advantages, difficulties, and important factors. Micromobility is being highlighted as a ray of hope for developing sustainable and inclusive transportation systems in impoverished areas of the world, where urbanization is still accelerating.

Examine the possible advantages of micromobility solutions in developing Regions. (Pustec Area)

Extensive public transportation networks are built into most modern cities in developed nations to facilitate people's mobility even in the absence of their own cars. Making every journey's first and last mile more convenient is a problem that even the most sophisticated public transportation systems have failed to address. For example, expanding train networks with more and more stations would make them a much slower mode of transportation, so this is not feasible. Micromobility is one solution that is currently garnering a lot of interest. *But what is micromobility?*

Large cities' challenges with short-distance travel are the focus of micromobility solutions. One example of a solution that has been implemented recently is the bicycle sharing program, which is available in many cities across the world, including Sydney, London, Washington, D.C., and many others. Since the bikes are available for anyone to use, these schemes are better described as shared micromobility. You just drop off your used bicycle at the closest collection point so that another commuter can pick it up after you've arrived at your destination.The goal of all micromobility solutions is the same, regardless of whether they are free or have a service charge: to give people an easy and affordable way to finish the first or last their final

leg of travel in a city. What happens in Pustec in the area we are studying if we were to implement this micromobility?
Pustec is a picturesque village located near the lake and as such is visited by many tourists. if we were to implement micomobility in this still undeveloped country by creating some points as below:

Reduced traffic – Initiatives that make scooters, e-bikes, and other small vehicles accessible in big cities can aid in reducing traffic. Without extending roads or implementing other costly modifications, it ought to be feasible to enhance traffic flow in the world's most populous city districts if brief trips can be accomplished on two wheels as opposed to four.
More environmentally friendly: In cities struggling with pollution, bicycles are an excellent option for micromobility systems. If small scooters are preferred over taxis or ride-sharing cars, they can even contribute to lowering the air's carbon monoxide content. Governments throughout the world continue to have serious concerns about the environment, so micromobility solutions' environmentally friendly features will undoubtedly make them a desirable option in all major cities and towns in the future.
Cost-effective transportation: Taxis and other alternatives are significantly more expensive than micromobility systems, which are operated by service providers at a fee. Using an e-bike or scooter for the final portion of trips is a great way for people to reduce the cost of their city travels.
Flexibility: The flexibility that micromobility solutions provide is one of their most appealing aspects. If you take a taxi, you have to tell the driver where you want to go, and once you're moving, it's difficult to change your mind. However, since you are in control when riding an e-bike, bicycle, or scooter, you don't have to decide exactly where you are going. A micromobility service is a great option if you want to explore a part of a big city at your own pace and don't feel like you have to schedule every minute of your day in advance.

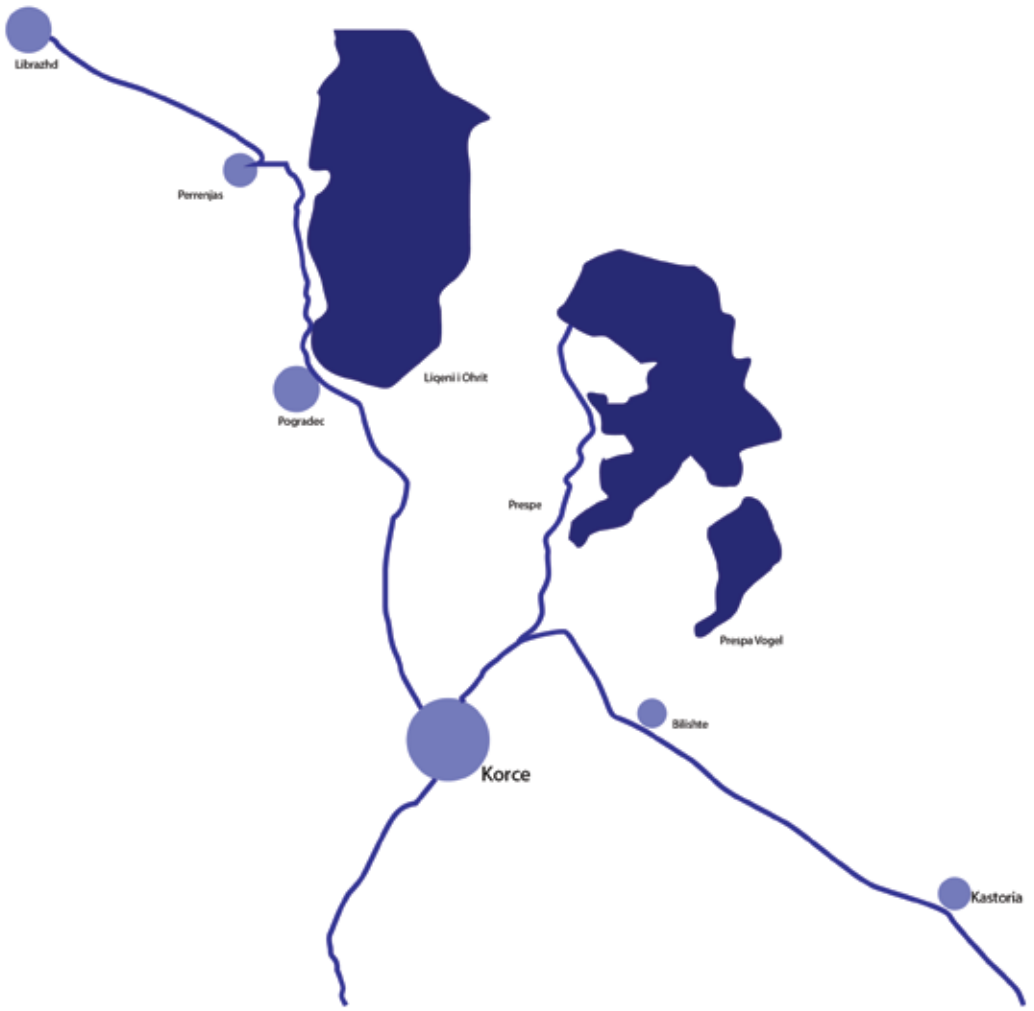

Fig.1. .Diagram map of Pustec Village. *source/ author (2023)*

Bringing attention to public transportation concerns

Micromobility schemes serve a crucial additional function beyond offering a quick fix for the first- and last-mile travel challenges that individuals in crowded cities encounter. These programs, when run on a cutting-edge software platform capable of gathering and analyzing travel data and vehicle usage, can identify flaws in public transportation networks and assist local governments in allocating funding to the most critical areas.

These advantages are supporting the growth of micromobility trends in numerous nations worldwide. Companies should think about providing micromobility services to draw in new clients if they're searching for innovative methods to boost the income from their fleets of vehicles. In the diagram below (Figure 1), the main points that can be connected to each other with the help of this micromobility are studied from our field visits. These points are like itineraries for different visitors, each offering a specific service.

Micromobility and Sustainable Transportation

Green Mobility: Managing the Transition to Micromobility and Sustainable Transportation

The rise of micromobility offers a promising path toward sustainable transportation solutions as the world faces the environmental effects of traditional transportation methods and rapid urbanization. Micromobility includes shared, lightweight, and frequently electric forms of transportation like e-bikes, electric scooters, and bicycles. The interaction between micromobility and sustainable transportation is examined in this talk, along with its possible advantages, difficulties, and revolutionary potential for urban mobility ecosystems. (Shaheen, Cohen, & Martin, 2019; Zhang, Lu, & Abou-Zeid, 2020).

Advantages of Micromobility for Ecological Transportation: The Effect on the Environment

Because micromobility options emit fewer greenhouse gases and leave a smaller overall carbon footprint than traditional modes of transportation, they are by nature more environmentally friendly. (Hugosson & Westin, 2019).

Decreased Congestion in Traffic: Through encouraging personal mobility and decreasing dependence on personal vehicles, micromobility helps to ease traffic congestion, resulting in quicker and more effective urban transportation. (Andreev & Blagoev, 2020).

Last-Mile Network Access: The critical last-mile gap in transportation networks is filled by micromobility solutions, which give commuters practical and adaptable ways to get to their final destinations.

Well-being and Health: By encouraging physical activity and lowering sedentary lifestyles, active modes of transportation like walking and cycling improve public health. (Martin, Shaheen, & Cohen, 2010)

Accessibility and Affordability: A wider range of people can use micromobility options because they are frequently less expensive than more conventional forms of transportation. (Fishman, Washington, Haworth, & Watson, 2015).

Difficulties in Putting Micromobility into Practice for Sustainability:

Infrastructure and Safety Issues: The broad implementation of micromobility may be impeded by inadequate bike lanes and safety issues, underscoring the necessity of strong infrastructure development. (Zolfaghari, Yildirimoglu, & Haugen, 2020).

Regulatory Frameworks: To address safety, liability, and operational issues, precise regulatory frameworks are necessary for the integration of micromobility into the current urban transport systems.

Technological Solutions: The successful deployment of micromobility services, such as app-based platforms and vehicle maintenance, depends on guaranteeing their technological security and dependability.

Equitable Access: In order to achieve sustainability and prevent future inequalities, it is imperative that micromobility services be available to all socioeconomic groups and communities. (Knapp, Mennicken, Reichelt, & Kirchner, 2018).

All urban residents must have access to mobility in a safe, environmentally responsible manner through a sustainable transportation system. When the needs and demands of people from different income groups are not only different but frequently at odds with one another, this becomes a complex and challenging task. For instance, many people must walk or ride bicycles to work if they cannot afford to use motorized transportation, such as private automobiles or public buses. It may be necessary to separate bike and pedestrian lanes from motorized traffic or lower vehicle speeds in order to provide a safe infrastructure for these users. The mobility of drivers may be restricted as a result of both measures.

In a similar vein, actions taken to curb pollution may occasionally clash with those required to lower the number of traffic accidents. For instance, while higher average car speeds may lower emissions, they may also raise the risk of accidents. (Zolfaghari et al., 2020)

However, the majority of public debates and official government policy documents pertaining to health and transportation exclusively address air pollution as the primary issue. This is due to the fact that air pollution is typically visible and has noticeable negative effects. Most people find it simple to draw the connections between increased morbidity from pollution, exhaust fumes from motor vehicles, and vehicle quality. (Martin et al., 2010) However, the majority of people are unable to comprehend the intricate interplay of variables linked to traffic accidents. (Fishman et al., 2015) All modes of transportation function less than optimally if the infrastructure design does not adhere to these criteria. Nonetheless, it is feasible to redesign the

Fig.2. .Itineraries of micromobility.. *source/ author (2023)*

current roads to give non-motorized modes a safer and more convenient environment.

When expressed in terms of the number of passengers carried per hour per lane in the corridor, this also leads to increased capacity and improved efficiency of public transportation vehicles. Individuals base their decisions about their mode of transportation on a variety of factors, including cost, the length of the trip, comfort, convenience, and safety. (Zhang et al., 2020) Out of all these worries, the person finds the safety concern to be the most challenging. The fact that a road user believes they will save more time by driving faster than they actually do is a significant factor in the perception of the advantages of mobility versus the perception of accident risk.1. Many users of the road benefit from the increased mobility, which is typically realized in very brief bursts of a few seconds. A comparatively smaller number of people who prevent many years of premature death from occurring sustain the safety benefit. The promotion of public transportation and non-motorized modes is crucial for sustainable transportation options. However, some of the recommended measures' inherent conflicts are not acknowledged in the actual policies that are being promoted. (Shaheen et al., 2019; Knapp et al., 2018).

The concept of sustainability transportation

The concept of sustainable transport is closely related to the development of sustainable modes, infrastructures, and operations of transportation. Three primary dimensions are taken into account: surroundings. One likely sustainable strategy is to lessen the effects of transportation on the environment. Climate change, noise pollution, and harmful emissions are all influenced by transportation. Transportation is responsible for about 15% of all greenhouse gas emissions and 22% of CO2 emissions. On the other hand, as cars become more ecologically friendly, the number of vehicles in the world is growing. Another strategic objective is to improve transportation's footprint, particularly the effects of infrastructure development and upkeep. Vehicles, parts, packaging, and other waste generators found in transportation systems need to be reduced, reused, and recycled. Finance. Employment, development, and economic growth are all influenced by transportation. It needs energy for operations, modes, and infrastructure, all of which can be used more effectively. Fair pricing for transportation would entail charging users the full cost of using the system, both directly and indirectly. It is likely that modal choice and efficiency will be enhanced in a transportation system with fair and open competition. Price distortions and capital misallocations may arise in a system where transportation is a public or private monopoly. Over time, these factors are likely to make the system unsustainable.Community. Sustainable transportation should minimize disruption to the community, be safe, improve human health, and benefit society. Car use has been stimulated by various societal developments. For example, reliable motor vehicles and the corresponding infrastructure of roads, petrol sta-tions, traf c regulation and the like became widely avail-able. Increases in spending capacity have led more and more people to own and use cars. Urban sprawl has in-creased the need to travel. In many countries around the world, infrastructural and societal organisation is tuned towards the wide-spread availability and the regular use of cars but in the pustec city this is nje element jo shume i zhvilluar. These (and other) developments have made the use of private cars attractive and is some cases even nec-essary. Indeed, many people claim they need a car in order to undertake their daily activities but if you choose another way . But people also presume the availability of a car when making choices on where to live, work, shop, or how to spend their leisure time. As a consequence, many people became dependent of their car use turned into a socio-economic ne-cessity, but if you choose a bicycle or something else in the Pustec you can develop this city, so the tourist can go to do sports. If there is a mobile app, you can choose how you will describe the road to the desert or choose the type of infrastructure, land or water. (Figure 2)

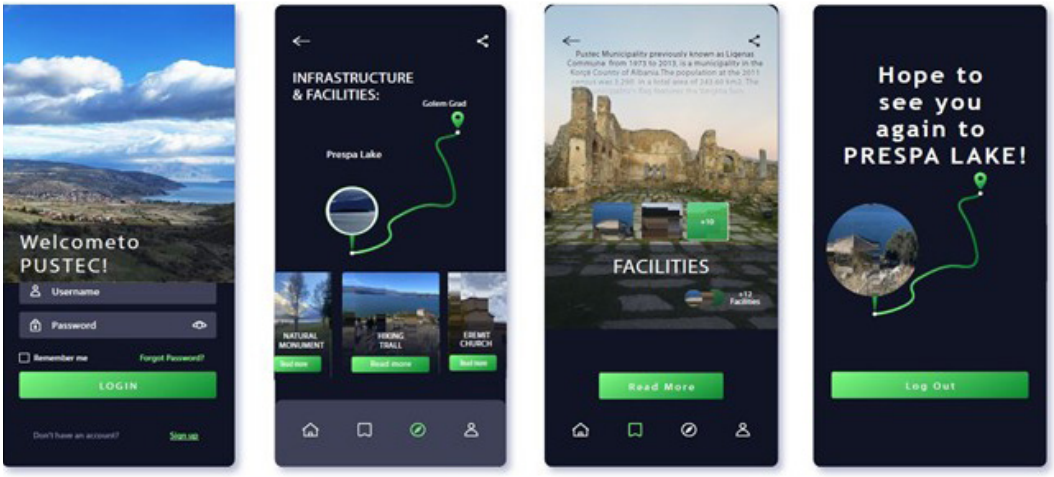

Fig.3. Mobile App Design for Pustec. *source/ author (2023)*

Reducing the need for travel is perhaps the single most significant factor in sustainable urban transportation, and mixed development and land use planning are the best ways to achieve this.
It is necessary to create additional tactics that promote the adoption of energy- and environmentally-friendly modes. Parking and traffic control techniques should be used to discourage the use of solo driving. The planning and administration of road transportation in our cities can be done in a number of economical and efficient ways.
Our cities are becoming less and less sustainable. The widespread use of roads for the movement of people and goods is one of the main causes of unsustainability; it is the source of air, water, and noise pollution, traffic jams, delays, accidents, stress, and annoyance. Cities will become far more sustainable and livable if efforts are made to steer urban transportation in a sustainable direction. If human survival is to be ensured, a transportation system that permits a high degree of accessibility and mobility without adverse effects is not only desirable but also necessary. Thankfully, it is technically possible, but if the goal of sustainability is to be realized, substantial adjustments to societal norms and governmental regulations will be necessary.

Feasibility and Impact

Urbanization and transportation issues are constantly changing, and developing regions are facing new challenges in finding sustainable solutions that take into account their distinct socio-economic and environmental characteristics. Micromobility, which includes shared, compact, and frequently electric forms of transportation, appears to be a ray of hope for the paradigm shift in transportation. This talk explores the viability of deploying micromobility solutions in developing nations and looks at how it might affect affordability, accessibility, and environmental sustainability. A significant challenge is the limited infrastructure that currently exists. Micromobility, however, calls for a redesign of the infrastructure, involving the establishment of designated lanes and safe parking zones. A supportive environment for micromobility can be established by concentrating on fundamental improvements, even though an initial investment is necessary. The way that urban transportation functions is changing significantly, and the idea of micromobility is leading this change. Micromobility, which includes small, shared, and frequently electric vehicles like e-scooters, bicycles, and electric bikes, is a paradigm shift toward effective and sustainable urban mobility solutions. This investigation explores the viability of micromobility and looks at how it might affect urban settings. It covers a range of topics, including regulatory frameworks, infrastructure adaptation, economic viability, and the revolutionary effects on affordability, accessibility, and environmental sustainability.
It is necessary to reevaluate urban infrastructure in light of micromobility. Although many cities were originally planned with traditional forms of transportation in mind, micromobility necessitates the installation of designated lanes, safe parking areas, and electric vehicle charging stations. The viability of this adaptation is contingent upon the infrastructure currently in place in the city as well as its willingness to make the necessary investments. The viability of micromobility solutions heavily depends on economic factors.
The financial feasibility of these systems is influenced by the expenses related to setting up and managing the required infrastructure, purchasing and maintaining fleets of micromobility cars, and taking care of regulatory compliance. In order to overcome financial limitations, public-private partnerships, creative business models, and community involvement are essential.
The regulatory environment has a big impact on whether micromobility is feasible. It is critical to set precise rules for the use, security requirements, and incorporation of micromobility into the current transportation systems. The effectiveness of these solutions depends on how easily regulatory frameworks can be modified to support micromobility and create an atmosphere that is favorable to its expansion.
Technological advancements are intrinsically linked to micromobility. The viability of these solutions is contingent upon a city's technological infrastructure, which includes elements like payment systems, fleet management integration with smart technologies,

and integration of mobile apps. Strong technological capacities put cities in a better position to embrace and adjust to micromobility.

Micromobility's acceptance and uptake by the community are key to its success. Important components of community acceptance include recognizing local preferences, addressing safety and accessibility issues, and making sure micromobility fits within the socio-cultural context. Initiatives for community engagement and successful pilot programs can open doors to wider acceptance.

Potential Impact:

Micromobility has the potential to completely transform urban accessibility. Micromobility solutions fill in the holes in the current transportation networks by offering first- and last-mile connectivity. Underprivileged communities and places with restricted access to conventional modes of transportation will be especially affected by this.

One of the main factors influencing micromobility's widespread adoption is affordability. By providing affordable substitutes for conventional means of transportation, these solutions increase accessibility to mobility for a wider range of people. Concurrently, the rise of micromobility generates economic prospects by means of employment generation, maintenance services, and regional car production.

Micromobility is consistent with international efforts to maintain a sustainable environment. Micromobility is a means of promoting human- or electric-powered modes of transportation that help create more environmentally friendly urban environments by lowering carbon footprints and emissions.

In urban areas, micromobility may help reduce traffic congestion. Micromobility lessens the need for wider roadways and traffic jams by promoting individual mobility through the use of smaller, more maneuverable automobiles.

Public health is improved when active transportation options like walking and cycling are promoted. Micromobility addresses health issues linked to inactivity by encouraging physical activity, lowering sedentary behavior, and enhancing general wellbeing.

For micromobility to be successful in the long run, safety issues like bicycle or e-scooter accidents must be addressed. Enforcing safety laws, launching public education initiatives, and funding infrastructure that prioritizes safety are crucial first steps.

It takes careful planning to incorporate micromobility into the current public transportation systems. Efficient transitions between various modes of transportation require the development of cohesive payment systems, schedule coordination, and connectivity assurance.

Given how much data micromobility depends on for operations, it is critical to address privacy and data security issues. Gaining the trust of users requires putting in place strong data protection measures and making sure that data usage policies are clear.

Conclusion

The adaptability of cities, stakeholder commitment, and regulatory framework resilience all play a role in the viability and effects of micromobility solutions on urban transportation. Micromobility is a dynamic and transformative force that offers a vision of efficient, accessible, and sustainable urban mobility as urban areas change. Cities can fully utilize micromobility to influence the direction of urban transportation by taking into account feasibility factors, utilizing successful case studies, and taking proactive measures to address obstacles.

Bibliography

[1]Shaheen, S., Cohen, A., & Martin, E. (2019). Micromobility: A Global Overview of Vehicle Sharing Schemes. Transportation Research Interdisciplinary Perspectives.

[2] Fishman, E., Washington, S., & Haworth, N. (2014). Bike Share: A Synthesis of the Literature. Transport Reviews.

[3] Zolfaghari, A., Zolfaghari, A., Yildirimoglu, M., & Haugen, T. (2020). A Review of the Urban Transportation Sustainability Literature: What Do We Know and What Does it Mean?

[4] Fishman, E., Washington, S., Haworth, N., & Watson, A. (2015). Factors Influencing Bike Share Membership: An Analysis of Melbourne and Brisbane.

[5] Andreev, P., & Blagoev, D. (2020). Shared Micromobility Services: Review of Practices in Urban Environments. Sustainability, 12(19), 7909. doi:10.3390/su12197909

[6] Li, W., & Cheng, T. (2019). Understanding the Usage and Impact of Free-Floating Bike Sharing System: A Case Study of Shanghai.

[7] Hugosson, M. B., & Westin, K. (2019). Assessing the Sustainability of Urban Micromobility Services: A Review of the Literature and a Research Agenda.

[8] Knapp, S., Mennicken, S., Reichelt, M., & Kirchner, A. (2018). Sustainability Impacts of Carsharing in the United States: Exploring the Connection between Carsharing and Public Transit.

[9] Zhang, H., Lu, C., & Abou-Zeid, M. (2020). Micromobility Services: A Review of Models and Applications.

[10] Martin, E. W., Shaheen, S. A., & Cohen, A. P. (2010). Assessment of Bicycle Commuters' Exposure to Traffic-Related Particulate Matter: An Underestimated Environmental Risk.