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ELECTRIC MICRO MOBILITY VEHICLES - TECHNOLOGIES, OPPORTUNITIES, ASSESSMENT AND FORECAST

Key Words

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MaaS

Abstract

Today thanks to rapid development of electric vehicles we are witnessing of booming new mobility service called Micro Mobility. Micro Mobility is a category of transport modes that includes variety of extremely light vehicles with limited range, such as electric: scooters, skateboards, bicycles etc. Electric micro mobility vehicles, compared to cars, are extremely cheaper to own, occupied less space and they are significantly more energy and fuel efficient. They require little or no additional infrastructure. This emerging mobility service is not detailed studied, so this will give chance to researchers as well as professionals to deal with this issue. Electric Micro Mobility can expand access to public transportation, increase mobility, reduce environmental footprint, and save money. On the other hand, we must address concerns over safety and how to best incorporate two-wheel Electric Micro Mobility traffic on streets and pedestrian sidewalks. Large cities are facing increased congestion and pollution problems. With emergence of Electric Micro Mobility cities now can tackle with congestion issues. This paper will present the review of Electric Micro Mobility Technologies, analyse opportunities of Micro Mobility, assess and forecast the Electric Micro Mobility as a service.

1. INTRODUCTION

The term "micromobility" has become a catch-all term for several modes of transportation, namely docked and dockless bikeshare systems, electric bikes and

electric scooters. Many of these modes share some distinct features (DuPuis et al., 2019).

Micromobility is the trip in short distances. This trip is usually between walking and driving distances or trip related to the first or last kilometer of traveling with another transportation mode, usually public transport. Micromobility is increasing in cities, especially booming increase is in electric micromobility.

Micromobility is revolutionary due to a several advantages related to electric micromobility vehicles such as: weight, space, efficiency, running costs, healthy and environment friendly, etc.

Urban population is growing, car ownership is growing, along with increase of urban mobility resulting congestion on street network. Micromobility will play a crucial role of additional mobility service in cities, thus helping tackle with increasing congestion. With micromobility, cities will achieve a reduction in congestion, as well as changes in parking and road space allocation.

Due to its advantages, electric micromobility will replace car for the significant number of short trips and especially short trips in cities. This will help cities to exclude cars from city centres.

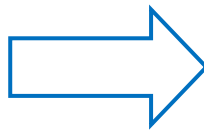
2. HISTORY AND DEVELOPMENT

Since ancient times, roads and street were for pedestrians, horses and carriages. From the beginning of motorization cars occupied streets and roads. At the same time small vehicles emerge, but they did not increase their influence until the beginning of 21st century (Figure 1.). Increasing usage of small electric vehicles for micromobility purposes is due to decrease of weight of micromobility vehicles, increased life of battery and increased distance that small micro mobility vehicles can cover.

The history of electric micromobility vehicles is marked by many attempts (Figure 2.). Electric scooters gain popularity and win due to their costs, simplicity, weight, and other advantages over other types of small vehicles.



Woman riding an electric scooter, 1916



Woman riding an electric scooter, 2019

Figure 1. Development of micromobility vehicles



Figure 2. Types of electric micromobility vehicles

3. ANALYSIS OF MICROMOBILITY STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS

The number of vehicles in the world is increasing, which has numerous negative effects on society, such as traffic congestion, air pollution, noise and other negative effects (Glavic et al., 2017, Glavic et al., 2019). This problem is emphasized in big cities and is caused by a large number of car related transport demands. To manage this problem many measures of Transport Demand Management-TDM can be applied to reduce the use of cars. Among these measures, the one that is the most effective is shifting from car to other more environment friendly modes of transportation, where micromobility can play crucial role together with public transit (Figure 3).



Figure 3. Micromobility as a MaaS

At the moment, an increasing number of researchers and decision makers are recognizing micromobility as a promising mode of transportation.

This concept restricts the total use of cars in the way that the users use electric micro-vehicles for short trips or for last and first mile instead of cars. Distribution of trip distances is presented on Figure 4. One can see that majority of trips are short trips up to 8km or 5 miles.

Micro mobility is a booming mobility service that can cover this short trips, especially in last few years (Figure 5).

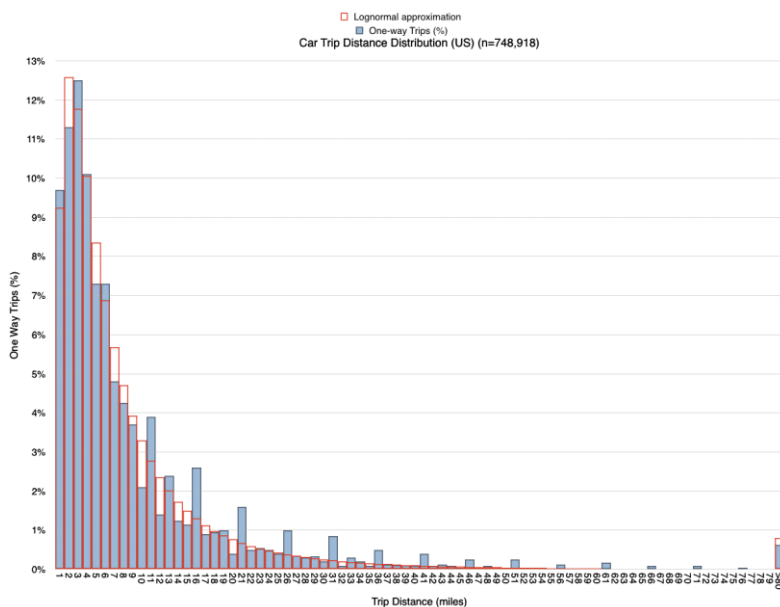


Figure 4. Distribution of trip distances (Dediu, 2019)

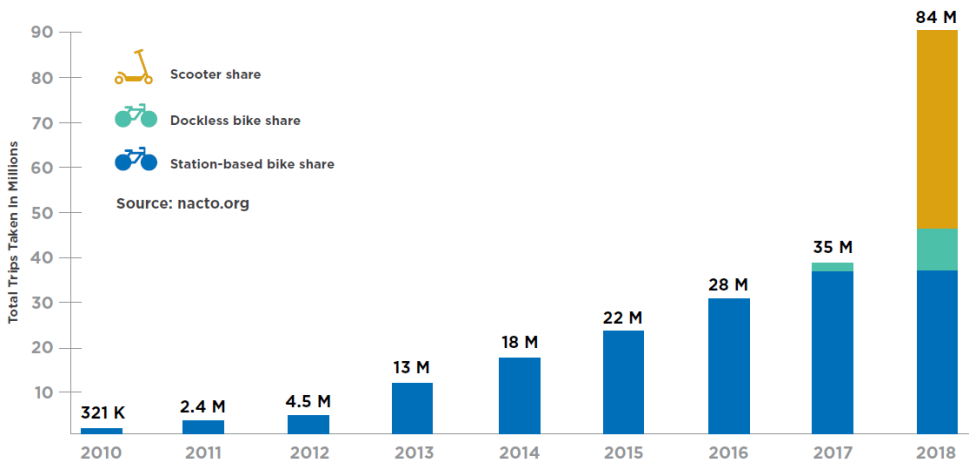


Figure 5. Trips on shared micromobility 2010-2018 (DuPuis et al., 2019)

The analysis of electric micro mobility is conducted with a SWOT analysis. SWOT analysis is a structured planning method that helps to evaluate the strengths, weaknesses, opportunities and threats.

The SWOT analysis also helps the decision-makers to better understand micromobility and effect of micromobility on users and cities. Results of conducted SWOT analysis are represented in Table 1.

Table 1. SWOT analysis of micromobility

	Micromobility
Strengths	Reduction of car traffic Reduction of parking congestion Generation of revenues with shared micromobility (which can be allocated to Public transport subsidies and infrastructure investment) Air quality improvement Reduction of Noise Reduction of Climate change Urban space improvement Better Land-use
Weaknesses	Traffic safety Lack of regulation rules and laws

	Micromobility
Opportunities	Social equity Eco mobility Shared mobility Can reduce number of parking lots Can reduce number of traffic lanes for cars
Threats	Legislative framework Enforcement measures Weather conditions Terrain conditions

According to SWOT analysis one can see that micromobility have many advantages and opportunities. While weaknesses and threats are caused mainly due to a rapid and booming usage of micromobility that did not followed with rapid changes in space allocation and regulation.

4. CONCLUSION

Micromobility vehicles as an emerging technology and micromobility as a MaaS can reduce our environmental footprint, save money, increase efficiency, increase population health and improve use of land.

Still some questions stay unanswered such as safety, law regulations and how to incorporate two-wheel micromobility electric vehicles traffic on streets and sidewalks.

Solution is in new allocation of street space. Land and lanes should be taken away from cars and dedicated to pedestrians, micromobility vehicles, and public transit.

Safety issue is also important. Accidents involving pedestrians and riders or riders and cars are common due to a lack of regulation and old street design. To solve this issue redesign of infrastructure is needed. Some measures can include new lanes on spaces previously dedicated to cars, or even create road barriers between micromobility vehicles lanes and car lanes.

Another measure that can improve safety is regulation. As micromobility vehicles are emerging concept of mobility, regulation mainly do not exist for it. Currently due to a rapid development of micromobility local authorities usually do not have proper regulations.

Weather and terrain conditions is issue that can restrict usage of micromobility in cities with cold climates, such as snow conditions or cities on hilly terrain. Terrain issue can be solved with increased capacity of batteries and with more powerful engines, but weather restriction will remain.

Despite all of issues that need to be solved, future look bright for micromobility thanks to advancing technology in batteries and implementation of AI and BIG data usage for shared micromobility.

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