# Towards Hybrid Urban Mobility: Kick Scooter as a Means of Individual Transport in the City

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# Towards Hybrid Urban Mobility: Kick Scooter as a Means of Individual Transport in the City

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**Abstract.** The characteristic feature of a contemporary city is its inconvenience and oppressiveness caused by the hitherto dominant paradigm of urban planning based on car mobility. As a result, the inhabitants have to cope with air pollution, noise, spatial barriers, sedentary lifestyle and other factors which worsen their health and quality of life. Ecological and physically activating urban mobility thus plays an increasingly important role in the process of creating a friendly and healthy city. For many years, a steadily increasing share of bicycles in urban traffic has been observed. There are also other trending forms of non-motorized transport, such as in-line skates, skateboards, kick scooters, etc. Riding each of them can be regarded as a form of recreation or sport, but also as an ecological, physically activating means of urban mobility. The paper discusses the different forms of recreational mobility in the context of the possibility of combining it with city public transport, with particular emphasis on kick scooters. Kick scooters are becoming more and more popular, not only among children and youth, but also among adults, who use it mainly as a means of the non-motorised urban transport. Numerous publications from different parts of the world show a dynamic growth of this phenomenon. The aim of the article is also to answer the question in what extent the design of public space takes into consideration the use of these new forms of transport and recreation and, consequently, what aspects and requirements should be taken into account in the planning and design process. The paper presents the conclusions of a field study carried out with a group of students in Szczecin and Berlin. The aim of the research was to evaluate the possibilities of using kick scooters in big cities as a means of hybrid mobility combined with public transport by exploring the spectrum of public spaces (streets, squares, traffic nodes and hubs, public buildings, etc.) and testing the existing urban infrastructure. The experiment and research results seem to confirm the vast possibilities granted by kick scooters in this regard.

## 1. Introduction

The model of urbanity that was applicable until recently, grounded by the doctrine of the Athens Charter after the World War II or by urban concepts such as the Broadacre City of F.L. Wright, was based on the dominant role of car mobility in the city. However, the assumption that providing technical infrastructure for automobiles and planning cities based on road transport is the cure for urban problems proved false. Highly developed countries, which have opted for individual car-based mobility, are currently experiencing polluted air, noise, and barriers resulting from overgrown road infrastructure and spatially broken cities. The residents of these cities suffer from more common civilization diseases,

including an increasing share of diseases resulting from a sedentary lifestyle. The above is the reason why today one can observe a number of trends in changes of lifestyle and urban mobility models [1].

At a time when Western countries develop their cities based on car mobility, in developing countries such as communist China, India, and Cuba, bicycles and rickshaws are the primary means of urban transport, along with pedestrian traffic. What was the effect of their economic shortcomings, today, paradoxically, is being discovered as a new, desirable model of urban revolution not only in terms of public transport, but also in terms of the widely understood sphere of an urban lifestyle. Taking into account the above factors, ecological and physically activating urban mobility plays an increasingly important role in the process of creating a friendly and healthy city [2].

Bikes and Personal Mobility Devices (PMDs), such as kick scooters, inline skates, and skateboards, serve in a dual role: as the means of ecological, Non-Motorized Transportation (NMT), and as a form of physical activity. Physical activity is essential for human health and the enhancement of life quality. Carrying out physical activities in urban public spaces contribute to strengthening social relations as it allows one to spend time with family, friends, and members of local communities. It can take the form of either recreation or sport competition. Thus, the question of the appropriate design and management of roads and bicycle paths, pedestrian recreation, and sports infrastructure seems to be especially important in the cities, as it promotes the use of all the varieties of PMDs [3].

Today, one can observe a tendency to search for an urbanity based on compact city design, ecological individual and public transport, and urban lifestyle democratization, where the equality of citizens may entail the absence of privileges for car users. That is why public transport in conjunction with PMDs can be a promising direction of the urban communication and social revolution.

For several decades now, a return to cyclable and walkable cities by introducing NMT has been an important element of urban planning [3]. These trends are set primarily by the Nordic countries (particularly Denmark and the Danish architect and urban planner Jan Gehl, who has been advocating the idea of cities for people, not for cars, for forty years already [4]), but the Netherlands and Germany are also the leading countries in creating a friendlier, accessible, and healthy urban space by eliminating cars from city centres. The introduction of the Environmentally Sustainable Transport (EST) to the cities opens an opportunity to improve health conditions by decreasing contamination. In turn, the use PMDs contributes to the physical activation of the residents, thus improving their health as well.

The paper presents the results of a preliminary research undertaken in order to test the utility of kick scooters in urban space as PMDs combined with public transport. The study assumes that this model of mobility may soon become one of the more commonly practiced forms of Hybrid Urban Mobility (HUM). The aim of the research was to examine in what extent the existing urban infrastructure allows for the implementation of this model and how the new approach to city design, resulting from the presence of PMDs, can make public spaces more friendly and accessible for users of different PMDs.

## 2. Physical activity in urban space

### *2.1. Health and physical activity of urban residents*

According to the research results, urban residents suffer increasingly from civilization diseases resulting from lack of physical activity. The research shows that for the first time since estimates of average life expectancy have been made the current generation of children will live shorter than their parents' generation. This is a direct result of obesity and insufficient physical activity [5]. That is why the issue of the proper design and adaptation of public spaces for the purposes of physical activity of residents is not only essential, but pressing.

Nowadays, out of all European children, Polish children are most at risk of obesity [6]. The growth dynamics of the number of obese children still increases since 2001. In other European countries, the rate of this increase is, however, much lower – particular attention should be paid to the example of Great Britain, where the recorded decline in the number of obese children has been the largest in the recent years. But it was also Great Britain, where at the turn of the 20$^{th}$ and 21$^{st}$ century the largest increase of obesity among children was observed. Realizing the importance of this issue, numerous activating programs have been successfully implemented and a set of principles of space planning and

design supporting physical activity has been developed [7]. Similar studies regarding planning and design issues in the context of physical activity are being conducted more and more often in different countries and cities, becoming one of the equivalent elements within planning the city structure and infrastructure. To a large extent, these studies are devoted to the issues of urban mobility, discussing the problems of pedestrians, bikers, PMDs, and NMT users [8, 9].

Nowadays it is Poland that has to face the problem of inactivity and obesity of children and youth. It should be noted that children derive their patterns and habits most effectively from the closest adults – their parents; it thus becomes crucial to activate the whole family and create conditions for joint participation in sport for all, which would not only improve their health, but also has an integration dimension and promotes the strengthening of family ties. The research results show that since the late 1970s, the fitness and physical abilities of children have been decreasing significantly [10]. Contemporary children are slower, weaker, and less agile. They spend much less time in motion and in the open air and much more time sitting in front of computer and TV screens than their peers thirty years ago. In view of the above phenomena, the design of urban spaces should promote physical activity by allowing for practicing a variety of activity forms and for the diversification of means of recreational transport in public spaces, as well as ensuring their appropriate connection with public transport and other urban functions.

*2.2 Recreational and physically activating transport systems*

As every other element of the city structure, sport and recreation function operate most efficiently if they work as a system. Sports and recreation facilities can be classified, depending on their spatial form in the urban tissue, as spot or linear. The spot facilities include sports fields, outdoor gyms, sports halls, swimming pools, playgrounds and other facilities located in one particular place. The linear facilities are those which, apart from the sport and recreation function, serve also as traffic concourses. This group includes roads and bicycle paths, pedestrian routes, trails and hiking trails, shared paths, and ecological corridors – the strips of parks and green areas. The ideal situation is when spot venues coincide with a system of linear facilities, thus allowing to move between different destinations in a safe and environmentally friendly way that is beneficial to health. It has to be borne in mind that school facilities, public spaces, cultural centres, and residential areas should also be included in this system for it to work properly. The issue of connecting the places of residence, education, work, and recreation with the city centre is particularly important, along with the integration of recreational and public transport (e.g. the "bike-and-ride" system).

To encourage as many people as possible to use bicycles and PMDs, bicycle and pedestrian paths and shared routes should give a sense of security and comfort. This can be achieved through establishing them independently from roads ad surrounding them with green areas and resting sites. The Scandinavian countries, the Netherlands, and Canada are the leading countries in terms of designing separate systems of bicycle paths. One of the most interesting architectural projects of a bike path is "The Bicycle Snake" in Copenhagen, built completely independently from other routes as an overpass that meanders between the buildings along the waterfront and partly over the water. This construction shows that the introduction of a safe cycling route is possible even where there is seemingly no space for that purpose. The project, with its intriguing form and orange colour, brings a new visual quality to the urban space. The path, which can be used by cyclists, pedestrians, and PMD users, is four meters wide, so it is convenient and safe. In Poland, one of the examples of a path for bikes, pedestrians, and PMDs which has no contact with cars is the recreational coastal route stretching along the Gdansk Bay beaches, from Gdansk to Gdynia.

American research has shown that three out of four American teenagers do not get the recommended daily dose of outdoor activity [11]. The research results also showed that physical activity has a positive economic effect: the construction of bike and pedestrian paths connecting schools, homes, and recreation areas significantly reduces the treatment costs of the diseases resulting from lack of physical activity. Every dollar invested in the construction of bike and pedestrian paths generates $3 savings in treatment

costs [11]. In addition, cycling and walking in a properly designed and arranged space increases the safety of urban residents.

Designing friendly, physically activating routes increases the possibilities of engaging in outdoor games, as the paths can be used not only for communication, but also for recreation and fun. *En route*, one can stop at various places located along the way, such as playgrounds, parks, outdoor gyms, etc. This gives the possibility of active recreation for the whole family. Therefore, stringing spot venues of physical activity (housing estates playgrounds, parks, sports fields, schools, sports halls, swimming pools, outdoor gyms) on the thread of recreation routes (for pedestrians, bicycles, and PMDs) seems to be crucial for promoting active lifestyle among urban residents. Integrating recreational and physically activating transport with public transport seems to be the best model of urban mobility and it should contribute increasingly to eliminating cars from the cities.

## 3. Hybrid Urban Mobility

It has been proved that a bike is a faster means of transport on short distances (up to 5 kilometres) than a car, considering the door-to-door trip time [12]. On the shortest distances walking is the most efficient, because it doesn't require extra time to park the vehicle (bike or car) and to reach the destination from the parking place. The need to combine pedestrian traffic with public transport is obvious and does not pose problems in a properly functioning city system. Combining both pedestrian traffic and public transport with cycling seems to be more problematic. Bikes can usually be transported by fast rail transport (subway or urban railways), but they are not always welcome in buses or trams, especially during peak hours. In this context, a kick scooter appears to be an interesting option.

A kick scooter is characterized by different advantages, which make it comfortable to use as a Hybrid Urban Mobility tool. Riding a kick scooter is about three times faster than walking, which in this respect makes it comparable to cycling. It is small, lightweight, easily manoeuvrable, easily folded, easy to carry, easy to hide under a bus or tram seat, granting extraordinary mobility and speed, especially when combined with urban transport. That being said, compared to a bicycle, a kick scooter also has some limitations. In a hilly terrain, bike is more efficient (uphill) and safer (downhill).

These features show that a kick scooter in conjunction with public transport is an attractive form of urban mobility, especially in those cases where the distance is too long to rely on a bike only. Using a kick scooter instead of walking can significantly reduce travel time; it is also acceptable in various large-scale public buildings, such as railway stations, shopping centres, culture and sports facilities, etc.

Obviously, this mode of transport also fits into the concept of the Environmentally Sustainable Transport [13]. HUM can be a part of the great change facing the cities in terms of transportation habits and mobility patterns, which is connected with the necessity of the $CO_2$ reduction. The reduction of motorized transport and the shift towards an increasing use of NMT also requires a further significant technological development, which is actually expected to take place [2].

The change in the mobility pattern should be implemented in full coordination with the planning processes and the change of the urban transportation structure. The transportation structure should be considered in terms of both the spatial and the organizational aspect: as the planning process of roads and routs for bikes, pedestrians, and PMDs, and as the coordination of different types of transport (e.g. public transport, NMT, PMDs). Using PMDs as a component of HUM, the urban structure can bring different places closer, making the city more accessible and friendly. It is widely accepted that pedestrian isochrones usually range from 5 to 10 minutes. The use of PMDs can significantly enlarge the area available within these isochrones. There already exist many studies, including organizational, management, planning, and design guidelines, taking into account the presence of PMDs in the city, both in the West and the Far East [14, 15].

A properly planned infrastructure for HUM (which combines public transport, and PMDs) can contribute to a positive change towards a greater density, accessibility, friendliness, and openness of the city as well as a wider choice of mobility forms. The result of the increasing variety of PMDs is a lack of uniform rules on how to use them in the cities. They can move at different speeds, which could pose a threat to pedestrians or other path users. The use of PMDs is not always allowed on bike paths or

sidewalks – the rules vary from country to country [3]. Therefore, it is reasonable to introduce multi-purpose shared paths with clear rules for the users, including a specification of maximum speed.

## 4. Experiencing and perception of the urban space on a kick scooter: The case study of Szczecin and Berlin

The idea of a study trip on kick scooters was inspired by the experience of visiting Vienna in the spring of 2016. There, a common use of a kick scooter combined with public transport has been observed among people of all ages, also the elderly. Vienna is a city where public transport structure relies largely on the subway. It is a compact city, intensely built-up, with good-quality pedestrian and cycling infrastructure – and, what is particularly important in the context of using a kick scooter, it is flat.

On the basis of this experience, a study trip to Szczecin and Berlin was organized. 14 students and 2 teachers of the Faculty of Architecture of Gdansk University of Technology (GUT) took part in it, equipped with 14 kick scooters and 2 skateboards as PMDs. The task was to examine the opportunities for using kick scooters as a means of transportation in the city space combined with public transport (bus, tram, subway). The most relevant reason for selecting Szczecin and Berlin was the fact that these cities differ considerably in terms of topography and urban morphology (Berlin is flat, while the urban grid of Szczecin is spread over undulating terrain).

The trip was planned for four days (including travel). The programme seemed very intense and could raise concerns as to its feasibility. The difficulty with the realization of the programme arose from the large number of objects to visit and urban spaces to explore. In Szczecin, apart from its historical values, famous contemporary architectural achievements can be found. The most known are Szczecin Philharmonic designed by Estudio Barozzi Veiga (Mies van der Rohe European Award 2015) and the Dialogue Centre Upheavals (which is a part of the National Museum in Szczecin) designed by Robert Konieczny (World Building of the Year 2016). Another reason for selecting Berlin was the opportunity it provided to supplement the curriculum of History of Architecture and Urban Planning and Urban Composition at GUT because of the rich architectural and urban heritage, both historical and contemporary. One of the most important objectives of the trip was to make the most of the visit programme. The use of kick scooters was supposed to intensify the effect of teaching by confronting theoretical knowledge with the direct experience of the cities and their architecture.

On the first day we were visiting Szczecin. We observed that the cycling infrastructure was not sufficient and the commonly used cobbled paving caused troubles for the small wheeled PMDs. Also, the undulating streets didn't make it easy to ride both uphill and downhill. On the other hand, the waterfront areas along the Odra river were well designed for different forms of activities (e.g. walking, cycling, fishing, skateboarding). What we found the most interesting was experiencing the architecture and multi-purpose space of a square which at the same time constituted the roof of the Dialogue Centre Upheavals. It is a fascinating example of architecture and urban arrangement that commemorates some of the most important historical events. Its intriguing architectural form brings order to the incoherent surrounding area, which is, at the same time, an inspiring public space, adjacent to the building of Szczecin Philharmonic. The design of the building, with the roof in the form of a sloping and slightly undulating square, allows to undertake different forms of activities on its premises (which was the intention of the architect). The kick scooters proved to be not only a means of transport, but also a source of great fun and joy, and the architecture of the Dialogue Centre Upheavals, in addition to its other functions – a unique playground (Figure 1).

On the second day we went to Berlin. We were exploring the city using both cycling and pedestrian infrastructure and all the means of public transport (subway, railway, bus). The kick scooters allowed us to explore even the interiors of large-scale public buildings (e.g. the shopping mall at Potsdamer Platz or the Main Railway Station in Berlin). We did not meet with a negative reception from other users of the space, even though we were a vigorously moving 16-person group. We were treated with full understanding and acceptance while we were waiting at bus stops, crossing subway platforms, using different means of transport, and riding through the buildings (Figure 2).

**Figure 1.** The group of students on the square-roof of the Dialogue Centre Upheavals. Szczecin Philharmonic in the background

Traveling by a kick scooter allowed us to experience the city in all its dimensions and aspects: everything that makes up the perception of urban space, architecture, history, the daily city life. During the single day we managed easily to traverse the vast spaces along the Karl-Marx-Alee (which is, as an example of totalitarian architecture, generally considered as a non-human scale design, unsuited to pedestrian traffic), the historical center of Berlin and the areas where East Berlin was unified with West Berlin (Potsdamer Platz, Kultur Quartier, Tiergarten, Spreebogen, etc.). Thanks to the kick scooters we were able to travel considerable distances (over a dozen kilometres) without being tired or weary, exploring the city with intensity unattainable for pedestrians.

On the third day we had planned a different "strategy" of exploring distant points, both in West and East Berlin. We visited the housing estate Siemensstadt, the Olympic Stadium, Le Corbusier's Unité d'Habitation, the Holocaust Museum, Kultur Brauerei, and several other places. Riding through these large-scale facilities was easy and quick. Although to get from one site to another it was necessary to use public transport (S-Bahn, U-Bahn, bus), it proved unproblematic and went smoothly. The negative aspect of this kind of traveling were connected with entering the subway and included the sense of a loss of perception of urban space (loss of spatial orientation, of sense of distance and direction), which is common also for pedestrians. It was a completely different experience of the city space than the one we had the previous day, when we were fully aware of the scale of the city and had a sense of orientation in the urban space and of the distances travelled.

**Figure 2.** On the subway platform in Berlin

## 5. The advantages and disadvantages of a kick scooter as an element of Hybrid Urban Mobility

The results of the research and the study trip are presented below in the form of a list of the advantages and disadvantages of kick scooters as a means of transport in the city.

### *5.1. Advantages*

(1) "Noticeable" acceleration of movement. It needs to be noted that this is not a measured ratio due to a lack of comparative studies, and it was impossible to verify this observation due to the intensive programme and short duration of the trip. This value may also depend on many variables such as the configuration of the terrain and the quality of the infrastructure. Therefore, it is difficult to determine how much faster (compared to pedestrians) one can travel using kick scooters; the perceptible speed, however, may be comparable to that of an easy riding cyclist. (2) Kick scooters allow to enter and experience all types of public spaces. (3) In contrast to bicycles, kick scooters cause no troubles in any means of public transport. Even during the peak hours there were no complaints in crowded buses from other passengers or the operating personnel. (4) Riding kick scooters is allowed in large-scale public buildings of different functions. (5) Using kick scooters makes it easy to travel long distances (several kilometres) and to acquire a "sense of the city" (perception of architecture, spatial orientation) comparable to that of pedestrians. Many details of the immediate surroundings may elude those who travel by car and even by bike. (6) A kick scooter can be easily used within the park-and-ride system. Due to its small size one can always have it at hand or in a car. (7) It is easy to ride a kick scooter with a backpack of the size and load of a typical 45-liter-capacity cabin luggage, which seems to be an interesting feature in the context of its tourist use. (8) Clothing, including footwear, is irrelevant. (9) Kick scooters are cheap and commonly available. (10) Riding a kick scooter is easy, healthy, physically activating, nature-friendly, pleasant, and fun, irrespective of age.

### *5.2. Disadvantages and limitations*

(1) Uneven surfaces of pavements and bicycle lanes considerably reduce the comfort of riding kick scooters due to their small wheels and the noise they generate. Basing on the experience of a 16-person group it could also be a big inconvenience to other users of the public space. (2) The hard rubber wheels

are unsafe on wet surfaces. (3) In the undulating terrain, kick scooters are inefficient (uphill) and dangerous (downhill). (4) Compared to a bike, kick scooters offer limited possibilities of carrying goods and passengers.

## 6. Conclusions

The experimental results indicate some attributes of both kick scooters and the urban spaces which, in future, may serve as the basis for the development of design guidelines and technical improvements. This, in turn, could contribute to the popularization of kick scooters as a means of urban transport. The knowledge provided by the research results should be verified during future study trips. This may contribute to formulating specific recommendations and design guidelines for public spaces and transport infrastructure.

The results of the theoretical research and the study trip confirm the benefits of using kick scooters as PMDs and as an element of Hybrid Urban Mobility. The conclusions apply to the design requirements of the urban areas, such as the adaptation of the pedestrian, bike, PMD, and public transport infrastructure. The study trip confirmed the advantages, but also revealed some drawbacks of using kick scooters, which could be the subject of further research and calls for attempts to eliminate them. There are two main reasons of possible inconvenience. One comes from the incompatibility of the cities and their infrastructure with this means of transport. The second one is connected with the faults of a kick scooter itself as a device. In our opinion, it is possible to eliminate both of these factors, but only on the condition of the long-term adaptation of plans and improvements. The fulfilment of this condition would depend on the awareness of municipal authorities and on the will of the residents to change their customs. This requires a mental transformation on the art of the members of the urban community, so that they would wish to benefit from the mode of combined transport that is the Hybrid Urban Mobility. Despite a few disadvantages, a kick scooter seems to be a promising solution for the problems of modern urban mobility.

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