SHARING ECONOMY AS A DIRECTION OF TRANSPORT SYSTEM'S DEVELOPMENT IN KATOWICE – CASE STUDY

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Abstract: *Contemporary urban transport networks are often characterized by significant problems related to the phenomenon of exceeding the capacity of the road network. The presented situation causes many problems - the phenomenon of transport congestion arises, noise level and environmental pollution increase. Escalating transport problems also negatively affect the economy of the entire region. The purpose of this paper is the presentation of current situation of Katowice transport network. An analysis of the strengths and weaknesses of the transport network was presented, as well as opportunities and threats that affect its condition were carried out. Subsequently, solutions in the field of sharing economy which contribute to the improvement of the city's transport network were presented. The assessment of that solutions was also carried out, in terms of their integration with the complementary elements of existing transport network. The entire analysis was based on statistical and cartographic data along with own observations. The conducted research suggests that Katowice is on the right path towards effective development of its transport network and balancing urban mobility. Nevertheless, further investments and greater emphasis on the integration of already existing solutions are necessary.*

Key words: *sharing economy, city logistics, regional development, transport network, metropolis*
JEL codes: *O12, O18, O22, H41*

1. Introduction

Katowice, as the capital and the largest city of the Silesian Voivodeship, is currently struggling with many transportation problems. Constantly increasing motorization density index and the relatively small capacity of the road network causes growing congestion problem. Increasing number of cars on the roads has enlarged the level of noise, environmental pollution and consequently decreased attractiveness of the city. Similar problems can be observed in other

urban areas of the Upper Silesian-Zagłębie Metropolis, which adversely affects the development of the entire region. This situation requires a new transport solutions that will minimize the negative effects caused by the constantly increasing number of cars. One of the directions of development of the Katowice's transport network may be solutions in the field of sharing economy. It is a model based on the sharing of unused funds for monetary or non-monetary benefits (Bernardi and Diamantini, 2018). A rental system for cars or electric scooters (carsharing), city bikes, activities related to increasing average number of public transport passengers - these are the exemplary directions for the transport's network development. These solutions, with a greater or lesser extent, already exist in Katowice, nevertheless, it should be noted that they can only completely fulfill their tasks while comprehensively integrated with the currently existing transport network. This paper is an attempt to evaluate existing solutions in Katowice - both in the field of sharing economy and in terms of their integration with complementary elements of existing transport network.

2. Methodology and Data

In this paper, a case study was presented where qualitative methods of describing the situation prevailing on the Katowice transport network were used. The SWOT analysis allowed to identify the factors directly related and affecting the city's transport system. Based on information from websites of entities operating in Katowice and own observations, solutions in the field of sharing economy have been identified. The combination of obtained data with cartographic data allowed to assess the degree of integration of the presented solutions with the city's transport network.

3. Transport network in Katowice

Katowice is a medium-sized city with around 296,000 inhabitants (www1), which together with Gliwice and Sosnowiec are often classified as the central cities of the Silesian Agglomeration, which is one of the most industrialized and urbanized regions of Central Europe. The population potential of the agglomeration is estimated at about 2 million inhabitants, while the average population density is 1642 people per km2 and is several times larger than the national average - 122 people / km2 - and European - 116 people / km2 (www2). There are many important car and rail routes for transportation (not only national, but also European) in Katowice. All these factors have a significant impact on the shape of the transport network of the region, as well as intensify all the problems.

In order to carry out the correct assessment of the transport network of the selected area, it is first necessary to define and identify its key problems (in the case of this analysis, it is exceeded capacity of the road network) and factors generating it. It is necessary to find out why the phenomenon has occurred and think of the possibilities of influencing it effectively. The instrument for obtaining such information is one of the most popular heuristic analytical techniques – the SWOT analysis, which allows to choose a specific area to be further examined. Its result is information about the strengths and weaknesses of the city (in the form of assets and barriers) and about the factors that create a chance for positive change or a risk of negative change (Houben et al., 1999). It should be noted, that the standard SWOT analysis is a qualitative method, which allows only to identify individual external and internal factors affecting the transport network, without determining the significance of it (H. Shinno et al., 2006). However, for the purposes of this paper, this is a sufficient solution that will be the basis for further consideration. Table 1 presents the SWOT analysis for the Katowice transport network.

Tab. 2 SWOT analysis for the Katowice transport network

Strengths	Weaknesses
– High city's ability to conduct investments resulting from the financial liquidity of the city, – the existing base of the transit network: A4, DW 902 (DTŚ), DK 1 (eastern bypass of the GOP) DK 79 (along with a fragment of DTŚ not belonging to DW 902), DK 81, DK 86, – developed bus and tram transportation, – high availability of the railway and access to many municipalities of the Silesian Voivodeship, – good condition of cycling infrastructure and pavements and the existence of devices significantly improving the safety of moving on them, – high concentration of specialists and experts on modern solutions in the field of urban logistics and public transport, – the possibility of adapting post-industrial areas for transport investments.	– The city is a very important regional, national and international hub for both road and rail transport, – existence of shopping malls within the city center, – insufficient number of parking spaces in the city center, – insufficient number of parking spaces for bicycles, – lack of a comprehensive network of bypasses, – lack of integrated network of interchange centers, – high population density and a high rate of motorization density index, – lack of Intelligent Transport System solutions in the field of traffic control, – the highest traffic volume on national roads (according to the General Traffic

	Measurement data for the Silesian Voivodeship), – transport barriers caused by the existence of a dense network of railway tracks and the motorway running through the city, – significant difficulties in the expansion of transport infrastructure resulting from the lack of undeveloped areas.
Opportunities	**Threats**
– Conducting integrated and directional activities related to shaping sustainable transport (e.g. Sustainable Urban mobility plan for the Central Subregion of the Silesian Voivodeship), – creation of the Upper Silesian – Zagłebie Metropolis – the possibility of obtaining European funds for purposes related to balancing urban mobility, – increasing the attractiveness of public transport through investments in fleet, educational campaigns and modern information systems - ŚKUP card or dynamic passenger information systems, – progressive changes in the way of life of citizens and greater environmental awareness of society, – existence and development of applications allowing to avoid congestion, – possibility of integration of street traffic systems of cities belonging to the Upper Silesian – Zagłebie Metropolis – following the solutions introduced in other cities (good practices), – cooperation of cities of the Upper Silesian – Zagłebie Metropolis - partnership programs in the domain of strategic investments for transport,	– Necessity of cooperation of cities participating in the Upper Silesian – Zagłebie Metropolis - a wide area for possible misunderstandings and conflict among the authorities, – the region with the largest increase in traffic in Poland, – high availability of road transport (favourable spatial arrangement of roads) may affect the choices of residents as far as means of transportation are concerned (they might constantly choose their own cars), – the possibility of creating inconsistent transport solutions that may increase the existing problems, – progressive disintegration of urban and regional transport, – lack of constant traffic research restraining an immediate response to the occurring situation, – carrying out minor renovation works (e.g. painting lanes) during rush hours, – development of commercial and service outlets in the absence of investment in infrastructure allowing non-invasive delivery (e.g. parking bays for delivery vans).

–	the possibility of adapting secondary roads to service some traffic flows and further development of already existing transportation routes.

Source: (Celiński et al., 2012), (www3), (www4) and own observations

Results from the analysis show that Katowice has a number of assets contributing to the efficient functioning of the transport network. On their basis, it is possible to create advanced tools contributing to the balancing of urban mobility. In addition, the location and specificity of the region and the activities undertaken so far provide a wide range of possibilities and facilities to introduce new solutions and their subsequent integration with the existing system. Of course, the city is not free from weaknesses or barriers that significantly restrain its development. Many of them are major problems, contributing to serious traffic congestion. These problems are mainly not related to spatial organization of the city, which allows to develop effective solutions contributing, in large part, to their elimination. In the city itself and in its environment, there is a risk of actions limiting or completely hindering work in the field of improving the functioning of the transport network. Until now, they mainly resulted from the structure of the Silesian Agglomeration – especially the lack of one administrative body - each city has separate authorities and distantly related goals and directions of development. However, this situation may change due to the establishment of the Upper Silesian - Zagłębie Metropolis. It should also be noted that the territorial area of the metropolis lies at the intersection of III and VI of the trans-European transport corridor (TEN-T), which provides large opportunities for the development of the transport network of the region - many investments have already been made, others will take place in the future (Janecki et al., 2009).

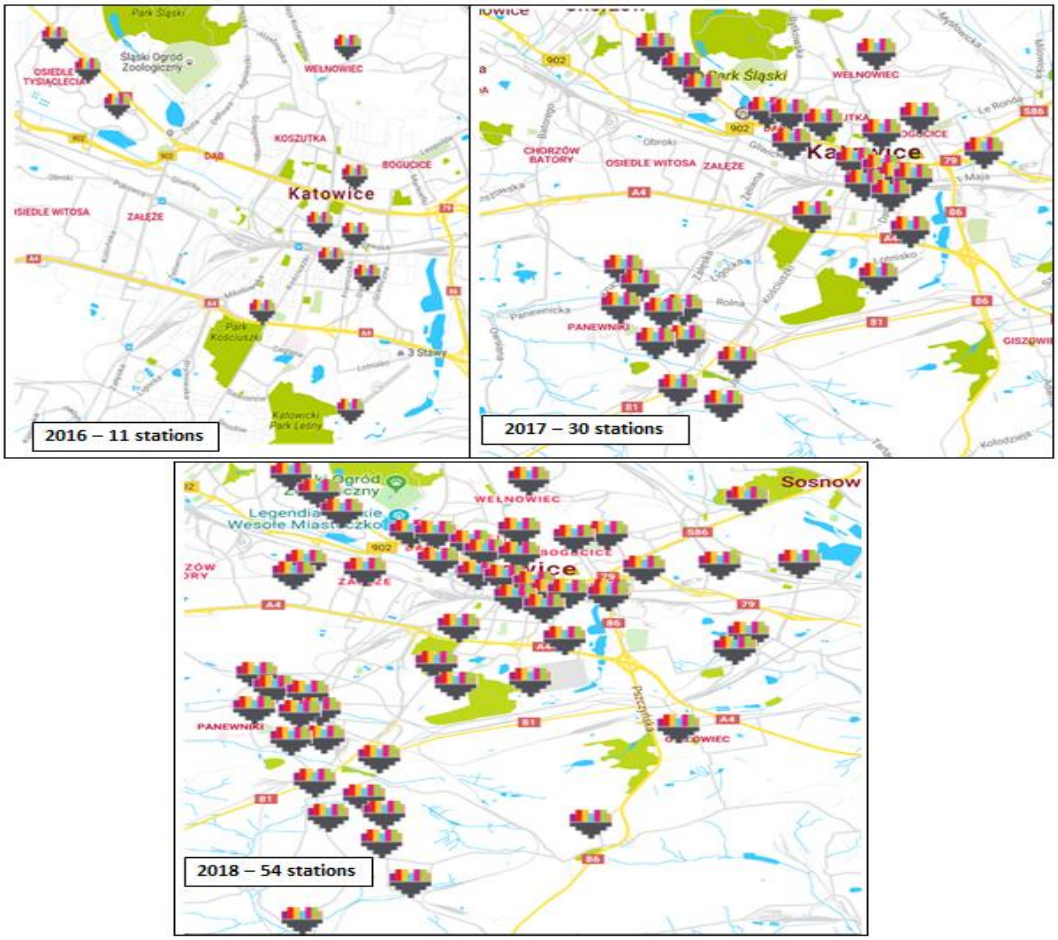
For the efficient functioning of the transport system, consistent and integrated actions are needed, requiring one transport policy for the entire region. Katowice and the entire metropolitan area have great potential for introducing modern and effective solutions contributing to reducing negative phenomena occurring on roads. Effective actions require analysis of the existing problem, proper selection of tools and a well-thought-out strategy of their implementation to the existing street - road system. Such challenging actions must be taken by the administration of all cities belonging to the newly-created metropolis, because any attempts to downplay this problem will sooner or later lead to serious negative consequences, felt both by the city's residents and enterprises or potential investors operating in the region.

4. Sharing economy in Katowice - identification and evaluation of existing solutions

Katowice, as a dynamically developing city, has so far introduced a number of transport solutions in the field of sharing economy. Investments carried out in this direction concern both modernization and development of road infrastructure, putting into service systems allowing the use of common goods and influencing the communication behaviour of residents. In this sub-chapter selected solutions will be presented that are consistent with the assumptions of the sharing economy and directly affect the communication behaviour of the residents. Their assessment will also be made in terms of integration with the existing city transport system.

One of the most recognizable solutions in the field of sharing economy, while being compatible with the environmental challenges of the 21st century, is the city bike rental system. However, it should be noted that this is not a new solution, as the first bicycle rental system was established in 1965 in Amsterdam (DeMaio, 2009). In Katowice, since 2015, municipal bike rentals have been operating. Initially, there were two stations that allowed renting a two-wheeler. Currently, 452 bikes can be rented in 54 places throughout the city. It is worth emphasizing, that the expansion of the bike rental system is possible thanks to the cooperation of private capital with self-government authorities (www5). Figure 1 presents the development of the Katowice city bike system over the years 2016-2018.

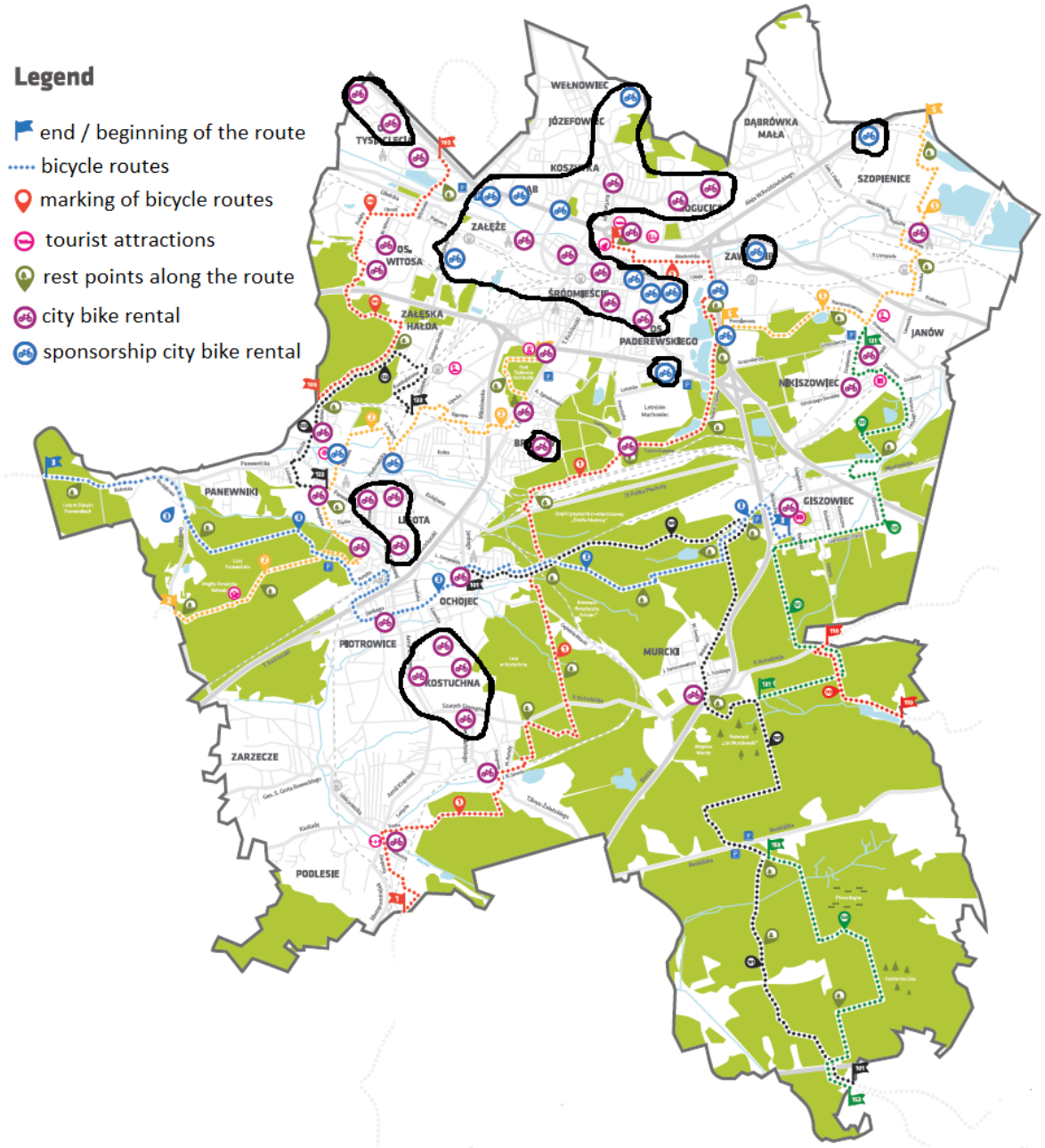
Fig. 1 Development of Katowice city bike system (2016-2018)



Source: (www5)

The enclosed figure shows that the city rental network in Katowice is rapidly growing. Citizens' initiatives related to the development of the system can also be observed - a good example is the Citizens' Budget (a special fund which the initiatives of the city's residents are implemented from), in which urban bike development projects can often be found. This situation has a very good effect on the condition of the Katowice transport network. A well-designed city bike system is the missing link between public transport and destination points of the city's residents, while being an ecological alternative to car travel (Midgley, 2009). In order for city bike rentals to completely fulfill their functions, their location should not only complement the existing public transport system - it is also necessary to integrate it with cycle paths. Figure 2 shows the location of the bicycle rental station against the existing cycling routes in Katowice.

Fig. 2 Bicycle network in Katowice



Source: own elaboration based on: (www6)

Although Katowice has many bicycle routes, the whole network is not coherent. Many residential areas do not have access to bicycle routes, and travelling around the city on a bicycle requires using a street network. Bicycle roads in Katowice are therefore mainly used for recreation, not for transportation.

Figure 2 also indicates bike rentals, which are not located directly next to any bicycle route. The northern part of Katowice turns out to be problematic, in which residents have access to city bikes, but they do not have access to bicycle routes. The character of the development

of northern districts (highest population density) created this awkward situation. Buildings are often located too close to the road - there is no possibility to build a bicycle route, and its designation as part of an existing street would require a pavement or road for cars to be used for this purpose. Such a situation causes a decrease in the attractiveness of city bicycles, which has a real impact on the degree of their use in urban journeys.

Carsharing is another example of activities consistent with the assumptions of the sharing economy that can be observed in Katowice. The vehicle owner can be both a natural and legal person who does not use his car too often. This allows to compensate the costs connected with owning the vehicle and the possibility of earning additional money. The idea of carsharing is also short-term rental of cars by companies specialized in this field. A well-developed car sharing system allows to reduce the problem of excessive congestion on roads, lack of parking spaces, air pollution or impossibility of access to the car for people with the lowest incomes. A car can be rented in many points in the city and returned close to the destination of the borrower (Yoon et al., 2018). One carsharing vehicle may replace from 8 to 20 private cars (www7). It should also be noted that modern ecological trends put pressure on car sharing providers that their cars meet the highest environmental standards (Euro 6). Turning from the Euro 1 norm (where many such cars are still driving on Polish roads) to Euro 6, the emission of dust drops by 96.43%, nitric oxide and hydrocarbons by 85% (www7).

There are currently two car sharing operators in Katowice - Traficar (www7) and Jeden Ślad electric scooter rental (www8). Additionally, as part of the climate summit held in December 2018 (COP24), a service for renting electric cars was launched - 20 cars and 23 charging stations (www9) were commissioned.

A definite advantage of car sharing services provided in Katowice is the fact that after using the vehicle, it can be left in any place allowed by law. This solution significantly improves the availability of the carsharing, as it does not require drivers to reach special docking stations (as it is in the case with city bikes). Nevertheless, giving people a choice to leave vehicles anywhere can lead to the situation where in some areas excess of vehicles could be noted, in others - their shortage (Laporte et al., 2018). The solution to this problem is relocating cars by the employees of the company to make them evenly distributed.

One of the IT solutions affecting the increase in the attractiveness of public transport, is the Silesian Charter of Public Services (ŚKUP), that has operated since 2015. The main task of ŚKUP is to replace the traditional paper ticket with its electronic equivalent. The card also supports parking fees, allows to use the services of city libraries, sports and cultural institutions,

as well as the city or municipality offices (www10). Currently, there are two variants of the card - personalized and non-personalized. The first contains data allowing the identification of its user, thus allowing the use of a wider range of services (e.g. coding of personal monthly tickets). The second variant does not contain personal data, which means that it is only possible to purchase bearer tickets (www10).

ŚKUP currently operates in 21 cities (www10). The wide range of services offered, easiness of use and the possibility of further development of the card makes it a very good tool contributing to increasing the attractiveness of public transport. Easy access to information, purchase of tickets from the home computer and the growing number of services will certainly result in a significant, constantly growing number of card users, which should clearly cause a reduction in the number of private cars in street traffic.

4. Conclusions

Katowice, as the capital of the Upper Silesian Agglomeration, already has a number of effective solutions contributing to the sustainable development of the transport network. However, it is necessary to constantly improve the existing system and carry out more and more new activities reducing problems occurring in the city's transport system. It is also extremely important to integrate individual systems, not only in the scale of the city, but the whole agglomeration, which is currently a peculiar "Achilles' heel" of the existing transport system. However, the recently created solutions, as well as those planned, indicate that the authorities of individual cities understand that only synchronization of activities in this field will allow effective limitation of the growing problems. Katowice is on its way to become an example of a well-functioning transport network for the region and other urban areas.

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