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Metropolitan bicycle-sharing system in the Polish context of various needs of cities, towns, and villages

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Abstract. Bicycle-sharing systems (BSSs) have started to play an important role in the transport systems of cities worldwide as a sustainable alternative to the dominant motorised mobility culture. BSSs have also expanded over time to include regions and metropolitan areas as well as small towns and rural areas. The purpose of this paper is to identify and compare the goals of connecting individual communes in a metropolitan area to a metropolitan bicycle system. The authors applied a case study of the MEVO metropolitan bicycle system consisting of electrically assisted bicycles, introduced in 2019 in 14 communes of the Gdańsk-Gdynia-Sopot Metropolitan Area (GGSMA) in Poland. The study used GGSMA-designated metropolitan zoning to group the goals pursued by the participants when joining the project. This paper is the first to identify the goals that inclined small towns and rural areas to accede to the BSS. The results show that the largest cities in the metropolis that make up its core count on bike sharing to solve the problems of congested city centres, while small towns and rural areas see the BSS as an opportunity to improve the quality of life of the inhabitants, as the first mode of public transport, as an opportunity to be closer and more identified with the metropolitan core, and as a chance to develop tourism and recreation.

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1. Introduction

Bicycle-sharing systems (BSSs) have become an important element of sustainable urban mobility at the beginning of the 21st century (DeMaio, 2009; Parkes et al., 2013; Faghih-Imani & Eluru, 2016). In the initial phase of their existence, BSSs were primarily designed to improve urban transport over short distances (Castillo-Manzano et al., 2016) and in the most congested areas; therefore, they were most often limited to city centres (Lovelace et al., 2020) and favoured short-term rentals (Vogel et al., 2011). Over time, authorities began to appreciate this solution in the transport of whole cities and even larger areas, regions (Kwiatkowski, 2021). However, it should be borne in mind that the bicycle as a mode of transport, even an electric one, is intended for short distances, so for large areas the right approach is to include bicycles in the multimodal transport chain (Martens, 2004; Jappinen et al., 2013). In Poland, attempts have been made in recent years to launch BSSs on an unprecedented scale, including more than one commune in one project. One of the first solutions of this kind is the MEVO metropolitan bicycle system, which in the first stage of the project, implemented in 2019, assumed the creation of a homogeneous BSS consisting of electrically assisted bicycles for 14 communes (urban, urban-rural, and rural) of the Gdańsk-Gdynia-Sopot metropolitan area in northern Poland.

The aim of this study is to identify and compare the goals individual communes had when joining the metropolitan electric BSS, using the example of the GGSMA. Due to the functionally and morphologically diverse nature of the study area, it was assumed that despite the single objective that was set for the project as a whole, the internal goals of the project participants would also be pursued in individual communes. Taking into account the differentiation of the communes-participants of the project in terms of (1) the size of the communes, (2) the functions they perform in the settlement system, and (3) the location of the communes in the structure of the metropolitan area, especially in relation to the metropolitan core, the author posed the following research questions:

- What is the goal of the project for the different participants—big cities, small towns, rural communes—and do these goals differ along with the characteristics of the administrative units?
- What problems can the introduction of an electric BSS in different parts of a metropolitan area solve?

The aim and research questions of this study will help show which functions a homogeneous and electric BSS can fulfil in different zones in a metropolitan area. While the findings related to the objectives pursued by large cities may provide expected results and this has already been well researched and documented, the objectives of small towns and rural areas remain unrecognised. Thus, the paper assumes that despite the homogeneity that characterises the implemented system, significant differences will arise from:

1. functions of particular communes in the settlement system of the metropolitan area;
2. the size of individual communes and distances between destinations;
3. transport problems and needs of individual communes;
4. accessibility of road cycling infrastructure.

The aim of the study and the research questions will allow the author to verify whether the project will perform similar or different functions in all zones

of the metropolitan area and how the differences between the planned roles of BSSs in large cities, small towns, and rural areas can become visible. The study is the first to compare the perception of a BSS between administrative units of different sizes and functions. This was possible due to the homogeneous nature of the BSS which, according to the project objective, was to be technologically alike in each of the units. The conclusions of this paper may be important for application purposes, especially for local governments planning to implement a solution of similar scale.

2. Literature review

Bicycle-sharing systems are a relatively new element in the urban transport system and have been strongly growing in recent years (Fishman, 2015, Todd et al., 2021). They provide a sustainable transport alternative (DeMaio, 2009; Zhang et al., 2015; Szymańska et al., 2016; Kwiatkowski, 2018a, 2018b; Borowska-Stefańska et al, 2021), which is especially appreciated in crowded centres of large cities (Hamilton & Wichman, 2018). This is also relevant to the increasing levels of urban pollution (Arsovski et al., 2018; Słodczyk, 2020). BSSs are also seen as one of the most important measures in cycling policy (Pucher et al., 2011; Kwiatkowski & Szymańska, 2021). As Cheng et al., 2021 pointed out, BSSs also play a role in building resilient forms of urban transport. Studies have shown that the introduction of BSSs increases the overall number of cyclists in cities (Shaheen et al., 2013; Martin & Shaheen, 2014; Ricci, 2015). It is also assumed that in the future, as has already been observed, electrically assisted bicycles will increasingly be added to BSS fleets (Kwiatkowski et al., 2021; Wolf & Seebauer, 2014; Shaheen et al., 2010).

Cyclists' access to protected road cycling infrastructure plays a significant or even decisive role in the popularity of BSSs (Karpinski, 2021; Guler & Yomralioglu, 2021). A similar relationship—an increase in the number of cyclists due to the development of cycle routes—applies to all cyclists, not just BSS users (Dill, 2009; Dill & Carr, 2003; Pucher et al., 2010; Handy et al., 2014; Nordengen, et al., 2021; Rodriguez-Valencia et al., 2019; Rodriguez-Valencia et al., 2021; Lopes et al., 2021), which is mainly dictated by safety reasons (van Petegem et al., 2021; Skoczyński, 2021). De Chardon, 2017 also proposed that BSS should only be created on a well-developed cycling infrastructure.

The differences in social, economic, or functional dimensions between urban and rural areas in metropolitan or suburban zones have been well described in the literature (Szymańska, 2013; Krzysztofik, Kantor-Pietraga et al, 2017; Biegańska & Szymańska, 2011; Biegańska, 2019). However, they are also prominent in the aforementioned cycling infrastructure. While it tends to be well-developed in urban areas, this is no longer the case in rural areas, as a US study by McAndrews et al., 2018 showed. In addition, rural areas, as highlighted in Hansen et al., 2015, have longer distances between destinations than in urban areas, which may also be detrimental to bicycle transport.

The functioning of BSSs in cities and user destinations have been well documented in research (Bao et al., 2017; Bi et al., 2021; Caulfield et al., 2017). However, there is insufficient evidence from the operation of BSSs in smaller settlement units. In the context of non-urban spaces in metropolitan areas, it is important to emphasise that bike sharing systems can become an effective multimodal transport component for the first and last mile (Krizek & Stonebraker, 2010; Shaheen & Chan, 2016; Si et al., 2019; Guo & He, 2020; Tarpin-Pitre & Morency, 2020) in combination with collective transport (Martens, 2007; Ma et al., 2015; Jonkeren et al. 2021). The advantage of BSSs over private bicycle in this respect is that you can leave your bike at the stop of another mode of transport without fear of having your own bike stolen (Arbis et al., 2016) and you make the same bike available for another user (Kwiatkowski, 2021). Due to the different functions of communes in the metropolitan area under study, it is also worth emphasising that a BSS can play a role not only as a means of transport for residents, but also for tourists (Yang et al., 2021), as well as for recreational cycling (Kaplan et al., 2015).

In recent years, bicycle-sharing systems have gained increasing interest in Poland, while becoming the subject of numerous studies (Kwiatkowski, 2018a; Podgorniak-Krzykacz & Trippner-Hrabi, 2021; Borowska-Stefańska et al., 2020; Dzięcielski et al., 2020a; Radzimski & Dziecielski, 2021). EU funding has also in many cases contributed to the

development of this form of transport (Dzięcielski et al., 2020b). As indicated by studies conducted in Poland by Wolny-Kucińska, 2020, Kwiatkowski, 2021, Bieliński et al., 2020, bicycle-sharing systems in recent years have also become an element of suburban zones and peripheries of metropolitan areas. While, as mentioned above, the goals of BSSs for large cities have been well documented, it has not yet been discussed what the aims are for small towns and rural areas (Audikana et al., 2017); Caulfield et al., 2017; Nikitas, 2019). Proper identification of goals is important because, as de Chardon et al., 2017 pointed out, defining a BSS goal is the basis for subsequent evaluation of its achievement. Moreover, the studies conducted so far have not shown whether a BSS can fulfil the same functions in different parts of a metropolitan area. It should be borne in mind here that this space is, after all, characterised by great diversity in spatial, social, economic, and functional terms (Szymańska & Matczak, 2002; Szymańska, 2013; Biegańska, 2019). Therefore, it has also not been indicated whether BSSs in these areas should work in the same format and with the same rules. This paper attempts to answer these questions and show the differences in goals for each metropolitan area zone.

3. Subject and area of research

The subject of this study is the MEVO bike sharing system, implemented for the first time in March 2019 in 14 communes (Fig. 1) by the GGSMA. The participants in the MEVO project included 14 of the 42 GGSMA member communes, including 8 urban communes, 3 urban-rural communes, and 3 rural communes. The work on the system was led by a project team established in 2017 by the GGSMA, which included the project leader and cycling officers from the communes that declared their willingness to participate in this project (metropoliagdansk.pl). The GGSMA is a self-governmental association of communes in Pomorskie Voivodeship, located in the functional area of the Tricity—Gdańsk, Gdynia, and Sopot—which is the core of the metropolis (Palmowski & Fedorov, 2019). The area is not formally a metropolis as defined by Polish law, although it has the potential and meets the criteria attributed to such areas (Sagan, 2017). According to the division established in the document The Gdańsk-Gdynia-Sopot Metropolitan Area Strategy until 2030, the GGSMA is divided into four zones (Table 1), whose member communes joined the project:

- Metropolitan core (three communes participating in the MEVO project – see Table 1);
- Strong urbanisation zone (six communes participating in the MEVO project – see Table 1);
- Border cities (one commune participating in the MEVO project – see Table 1);
- External zone (four communes participating in the MEVO project – see Table 1).

The characteristics of the different communes involved in the MEVO BSS are provided in Table 1:

The cities of Gdańsk and Gdynia, which belong to the metropolitan core, are also the most populous units of the area (see Table 1). The smallest population is found in the rural communes of the external zone, but these numbers can be assessed as high, as they exceed 10,000 for each of the communes. The longest cycling routes are in the metropolitan core and the rural commune of Stężyca due to its tourist and recreational functions. This commune has the highest ratio of bicycle paths in relation to the number of inhabitants. With respect to space, the highest ratio of bicycle roads per 100 km^2 was recorded in Sopot. As mentioned above, the location of the analysed metropolitan area also determines its tourist function, which is particularly evident in the communes located in the coastal zone and in the communes of the Kashubian Lakeland.

The planned BSS was to eventually consist of more than 4,000 electrically assisted bicycles without docking stations and in the first stage of implementation it was to comprise more than 1,000 bikes. Due to the termination of the contract with the operator in October 2019, the operation of the system has been suspended until a new operator is selected. A bidding process is currently (2021) underway to restart the MEVO system.

Table 1. Characteristics of communes participating in the MEVO BSS project (2019)

Metropolitan zone	Name of commune	Type of commune	A	B	C	D	E
Metropolitan core	Gdańsk	urban commune	470,907	262	196.0	4.2	74.8
	Gdynia	urban commune	246,348	135	65.1	2.6	48.2
	Sopot	urban commune	35,719	17	22.3	6.2	129.1
Strong urbanisation zone	Kartuzy	urban-rural commune	34,013	206	18.1	5.3	8.8
	Pruszcz Gdański	urban commune	31,326	16	19.8	6.3	120.2
	Reda	urban commune	26,307	34	11.3	4.3	33.8
	Rumia	urban commune	49,230	30	13.7	2.8	45.5
	Tczew	urban commune	59,951	22	21.9	3.7	97.9
	Żukowo	urban-rural commune	40,837	164	5.4	1.3	3.3
Border cities	Puck	urban commune	11,241	5	5.2	4.6	108.6
External zone	Sierakowice	rural commune	20,054	183	14.6	7.3	8.0
	Somonino	rural commune	10,814	112	3.8	3.5	3.4
	Stężyca	rural commune	10,664	161	45.1	42.3	28.1
	Władysławowo	urban-rural commune	15,388	42	28.8	18.7	68.3

Legend: A – number of inhabitants, B – area (km2), C – length of bicycle paths (km), D – length of bicycle paths per 10,000 inhabitants, E – length of bicycle paths per 100 km2
Source: own elaboration based on data from the LDB of Statistics Poland

Fig. 1. MEVO bike-sharing stations in the Metropolitan Area
Explanation: 1, 2 – Gdańsk; 3 – Tczew; 4, 5 – Gdynia; 6 – Kartuzy; 7 – Pruszcz Gdański; 8 – Rumia; 9 – Reda; 10 – Sopot; 11 – Żukowo; 12 – Władysławowo; 13 – Puck; 14 – Sierakowice; 15- Somonino; 16 – Ostrzyce (Somonino commune); 17 – Gołubie (Stężyca commune); 18 - Stężyca
Source: Michał Kwiatkowski

4. Research method

In order to investigate the goals of individual GGSMA communes for joining the metropolitan BSS, a qualitative study was conducted using the in-depth interview method, supplemented by field research and photographic documentation. The study was conducted between January and February 2019, prior to the launch of the system. The selected survey method was adapted to the project implementation stage – at this stage it was possible to analyse the goals of accession to the project before verifying their implementation. Nineteen people representing 13 of the 14 communes involved in the project and one representative of the project leader, the GGSMA association, participated in the survey. Officials responsible for the bicycle sharing project in each commune were invited to the survey; one commune (Puck) did not take up the invitation to participate in the interview. The invitation to participate in the survey was sent to all participating communes and the project leader via email. Communes independently selected their representatives–participants of the talks, indicating persons working in individual offices on the project of the metropolitan bike system. Thus, the survey featured bicycle officers from the cities of the metropolitan core, officials of municipal and communal offices in positions related to tourism, external funds, as well as representatives of local authorities—heads of communes and vice-mayors of cities. The study employed the in-depth interview method using a structured question form referring to the topics presented in Table 1. Due to the similarities of the systems, the same form was used previously in a study about a regional "Rowerowe Łódzkie" BSS implemented in Łódzkie Voivodeship in Poland, as described in Kwiatkowski, 2021. Interviews conducted as part of the study lasted between 20 and 90 minutes.

The results were analysed using the manual thematic analysis method, in which the answers to individual questions were matched according to the topic of the statement and the position of the represented commune in the structure of the metropolitan area. The responses obtained were assigned to the main thematic areas (transportation, quality of life, innovation) identified during the interviews. The results were analysed and presented in accordance with the zoning of the metropolitan area outlined by the GGSMA document: (1) metropolitan core, (2) strong urbanisation zone, (3) external zone. The border cities zone was not included in the analysis because it was represented by one commune that did not participate in the study.

5. Goals behind joining a regional BSS

The metropolitan bicycle-sharing system aims primarily at improving the transport accessibility of the metropolitan area, but the participation in the MEVO project is also associated with certain expectations expressed by the individual communes – the project partners. The objective of introducing bicycle sharing in the metropolitan area is common for all participants of the project – increasing the coherence of the area by improving transport accessibility. Due to the specificity of the partners involved in the project, resulting from the location within the spatial structure of the metropolitan area, the introduction of the bicycle-sharing system may play a special role for a given commune beyond the main objective. In order to establish the differences between the communes in this respect, the authors analysed their expectations according to the established division referring to the spatial structure of the metropolitan area.

5.1. The core

Cities forming the core of the metropolis – Gdańsk, Gdynia and Sopot – see the system above all as an opportunity to improve the quality of life of the city's inhabitants by improving transport conditions. The most important objective for which these cities decided to participate in the project was to improve the quality of the transport system in the city centres and to promote cycling as a mode of transport. The Tri-City metropolis was the last large urban area in Poland without a bicycle-sharing system. However, as the representatives of the Gdańsk Municipal Office emphasize, the hefty delay in the establishment of the system was dictated by the need to first prepare the necessary road infrastructure for

Table 2. Topics and issues of in-depth interviews in the regional bicycle-sharing system study.

General topic		Issues	
1.	Origin of the project	A.	Purpose of the project
		B.	Initiative for the project and local initiator
		C.	Rules of project financing
2.	Technical issues related to the operation of the system	A.	The decision to choose a 4th generation system
		B.	The decision to choose a year-round system
		C.	Drawing patterns from other systems
3.	Local conditions of project operation	A.	Identification of the system's target group
		B.	Decisions on the number of bicycles and location of stations
		C.	Experiences with bicycle-sharing systems
4.	Cooperation and participation of the commune in the project development process	A.	Cooperation and its nature, role of the commune in the project development team
		B.	Commune's opportunities to influence specific project elements during the design phase and comments made
		C.	Further cooperation within the project after its implementation
		D.	Formal aspects of project cooperation
		E.	Cooperation with communes in the region on other projects
5.	Towns' expectations in terms of transport, cooperation, innovation, promotion and quality of life of residents		

Source: Kwiatkowski, 2021

cyclists, which is fully in line with the good practice of planning the urban cycling transport system. Officials also indicate that the first objective was to promote cycling as a means of transport through the construction of a network of cycling routes, and the next stage was to complement bicycle transport with a bicycle-sharing system (Gdańsk MO). Gdańsk also emphasises that electric-assisted bicycles will provide greater accessibility – both of cycling for residents and of urban space using bicycles:

We have a bike that will work well on our hills (...). There are large differences in height here. This is completely unattractive for the average, ordinary inhabitant, who does not have his own bicycle, does not dress in a tight outfit and is reluctant to go uphill, just wants to drive from point A to point B. An electric bicycle on these hills will do its job.

In Gdynia, the bicycle-sharing system is to be an alternative to the existing means of transport, mainly cars. Gdynia wants to promote cycling to reduce the harmfulness of road transport, such as pollution, emissions of noise and traffic jams (Gdynia MO):

"We want the inhabitants to be convinced that the car should be used less frequently. Of course, no one has any such utopian visions that it has to go down to zero, because no – the car is also necessary and probably works, but not in the kind of congestion that we have in the streets of the city today. Our main expectations – creating a new transport branch which will be comfortable for the residents and a real alternative to the car."

The representative of Gdynia also emphasises the need to ensure the availability of the system:

"We've invested in a bicycle that is homogeneous, very easily accessible. We've decided that there should be more of them, more easily accessible, but that they should be at hand, in sight, so that they would be everywhere and so that the inhabitants would trust them. The residents must have confidence in the system for it to work."

For Sopot, bicycle sharing is supposed to be a way to reduce traffic jams in the city and improve air quality. The city authorities hope that the inhabitants will treat MEVO as a complementary element of public transport. In order to achieve this goal, the city plans to integrate cycling with other means of public transport through a common ticket. The city authorities also see the potential in shared forms of transport, hence the high expect tions for a bicycle-sharing system:

"Today Polish cities have a problem that they are crowded and overloaded with cars. We are in favour of a sharing economy, where there is car sharing, rental for minutes. It is assumed that one such car replaces 15 private cars. It also relieves our streets, as well as the bicycle traffic will also relieve them."

Sopot also conducts a number of other actions to implement cycling policy – each year new lanes and contraflow lanes for cyclists are created, and the zone of slow road traffic is extended by new streets in the city centre (Sopot MO).

The statements made by city officials from the core of the metropolitan area clearly show that the priority of introducing bicycle sharing is to improve the quality of urban transport.

5.2. The strong urbanisation zone

The expectations related to the implementation of the system prove different between the communes participating in the project due to their location in the metropolitan area. In the zone of strong urbanisation, attention is also paid to improving the quality of transport, but the specificity of this area also points to other problems related to city transport. In Kartuzy, the MEVO bicycle sharing will become the first public transport system in the city. City authorities also think of bicycle sharing as a means of bringing the city closer to the metropolis because the same solutions are also present in other cities. The representatives of Kartuzy also hope that the development of the tourist base will contribute to tourists also appreciating this solution (Kartuzy MO):

"Our city is also atypical in that we do not have our own public transport. There is also an idea to see how it works, whether the inhabitants will actually benefit from it. It's going to be like our first quasi-urban public transport. We'll skip the pagers – such technological progress."

The potential of the metropolitan bicycle is perceived in the same context by Tczew which considers the possibility of an increased number of visits by the inhabitants of the metropolis core who will deem it convenient to be able to use only one system to travel to Tczew. The city also places a clear emphasis on improving the quality of transport. The system is to be an element of cycling promotion, leading to an increase in the number of cyclists and a decrease in the number of people commuting by car. Representatives of the Tczew Municipal Office also emphasize that bicycle sharing can contribute to the reduction of traffic jams, emission of exhaust fumes and improve the health of residents (Tczew MO):

"Fewer traffic jams – less exhaust fumes – cleaner air – everybody is healthier – we will get everywhere faster."

Tczew also underlines the important role of the electric bicycle and its influence on the availability of this form of transport:

"If there is such a possibility for the system to be mostly electrically assisted – it might be worth going that way, because it's easier to convince a car driver to ride an electrically assisted bike than a regular bike, because they go faster, they get less tired, and maybe they can actually have any outfit—gala, business—those are the benefits an electric bike gives us."

The city of Pruszcz Gdański sees bicycle sharing as a new form of commuting to work, limiting traffic jams in the city and solving the problem of the lack of space for parking cars. Representatives of the Municipal Office also admit that despite the lack of a proper department dealing with cycling, they

want to promote cycling as an element of a healthy lifestyle of the inhabitants (Pruszcz Gdański MO):

"Certainly, our intention is also to improve the lifestyle of the inhabitants, so that they start using these bikes, so that there are fewer cars, which is difficult, but you have to start with something."

The Żukowo commune, in turn, focuses on innovations and is very willing to participate in projects through which it can provide its inhabitants with modern urban solutions (Żukowo Communal Office). For Reda officials, the most important factor is the satisfaction of the residents. Representatives of the Reda Municipal Office treat the system as a part of activities aimed at reducing traffic jams and increasing air quality in the city (Reda MO). For officials from Rumia it is pivotal to improve the quality of life of the inhabitants and increase the awareness of being part of the metropolis (Rumia MO).

Opinions collected in the communes of the strong urbanisation zone show that also in this area bicycle sharing can solve transport problems.

5.3. The external zone

In the last group, the expectations of the smallest communes which are furthest away from the centre of the metropolitan area were verified. Data collected in this area show that smaller communes also see the potential of bicycle sharing as an opportunity to improve the quality of transport.

For Władysławowo, it is primarily a new form of urban transport and a chance for a significant improvement in the quality of life of the inhabitants. Officials also recognise that it is a green mode of transport that promotes sustainable forms of mobility. Even before the system was launched, the city of Władysławowo saw the potential for launching new stations, this time also in other towns in the commune (Władysławowo MO). Representatives of the commune of Somonino admitted that the metropolitan bicycle-sharing project became the basis for discussion on the commune's bicycle policy based on the experience of the largest cities of the metropolis (Somonino Communal Office). The expectations of Sierakowice commune officials are that bicycle sharing will bring this peripheral commune closer to the largest centres of the metropolis. The creation of the MEVO bicycle in Sierakowice is one of the most important transport projects of the commune, together with the restoration of the railway line. All these activities are aimed at bringing the commune closer to the metropolis by improving the quality of connections with the main cities of the region. Representatives of the Sierakowice commune also admit that experience in the implementation of projects related to EU funding shows that common, intercommunal projects have a much better chance of success and receiving funding (Sierakowice Communal Office). The financial aspect is also highlighted by the commune of Stężyca, which deems its presence in the metropolitan area as a decisive factor in the financing of projects. Representatives of the commune of Stężyca also perceive MEVO as an opportunity to increase the commune's innovativeness and improve the quality of life of its inhabitants (Stężyca Communal Office). Local governments of the communes from the external zone point to a helpful role of the biggest cities in the metropolis in introducing the bicycle-sharing system and creating a framework for a local bicycle policy.

The communes in the external zone also notice a great potential for the use of the system by tourists. Launching the system in the communes of the Kashubian Lakeland or those located in the coastal zone will enable their numerous visitors to use the system during the tourist season. In many of these communes the inhabitants of the largest metropolitan cities own so-called second homes, so the possibility of using the same bicycle system both in the city of residence and in the holiday resort can be highly encouraging. Representatives of the communes also stress that the metropolitan bicycle-sharing project is the first project to drive cooperation on such a large scale. Previous projects in many communes have been limited to cooperation with neighbouring communes. Smaller communes also admit that the issue of co-financing with EU funds was of key importance when deciding to participate in the project. Representatives of small communes, being aware of the importance of the problem of cycling policy, admit that due to numerous other projects of higher priority and the inability to increase the number of specialised staff,

Table 3. Summary of the goals of joining the MEVO BSS in the individual zones of the GGSMA

Metropolitan core	Improving the quality of transport in congested urban centres, Limiting car traffic, Providing an easily accessible means of transport for all residents to commute to work each day
Strong urbanisation zone	Improving the quality of life for residents, Improving air quality – reducing pollution, Changing the lifestyle of residents, Modernisation – increasing the innovation of the commune, Aligning the transport system with the metropolitan core, Introducing the first means of public transport in the commune
External zone	Improving the quality of life for residents, Connecting bicycle transport with rail transport, "Getting closer" to the metropolitan core, Developing tourism

Source: own elaboration

the independent introduction of bicycle sharing without financial and substantive support would be significantly hampered.

5.4. Cele Goals behind joining a regional BSS – summary

The basic expectations of the communes regarding the implementation of bicycle sharing are heading in one direction, regardless of the location in the structure of the metropolitan area. The project participants agree that they expect an improvement in transport and, consequently, an increase in the area's transport accessibility. Due to differences between entities participating in this project, the survey revealed differences in complementary expectations of the analysed communes, largely depending on the size of the entity and its place in a particular group within the spatial structure of the metropolis.

The stated goals of joining the project also show what problems the different zones of the metropolitan area are facing. While the core struggles with excess motorised traffic and congestion in city centres, the strong urbanisation zone expects a transformation of lifestyle and quality of life and new, sometimes first, forms of public transport. The external zone articulates the need to "get closer" to the core of the metropolitan area, including through integration with rail transport. Due to the nature of the area and its functions, it also sees MEVO as an opportunity for tourism development. As it was shown, a metropolitan bike sharing system can also realise common goals for different zones of the metropolis (see Table 3), among which the improvement of the quality of transport and better connections between the communes of the metropolitan area are most important.

6. Discussion

A unified metropolitan bike sharing project may fulfil a variety of indirect goals in addition to its primary purpose, depending on where in the metropolitan area it operates. Regardless of the metropolitan area zone, the goals of individual communes were shown to be consistent with measures that benefit cycling that have been advocated in research. Regarding the assumption that differences in goals are due to:

1. functions of particular communes in the settlement system of the metropolitan area;
2. the size of individual communes and distances between destinations;
3. transport problems and needs of individual communes;
4. accessibility of road cycling infrastructure

it can be concluded that these aspects largely determined the differences shown. The study confirmed that the core cities that serve as the centre of the metropolis are mainly focused on solving the problem of too many cars in the central parts, which is in line with the indications of Lovelace et al., 2020. In metropolitan areas further away from the core, especially in small towns, the BSS can be the first means of public transport or an element improving the quality of life of the inhabitants – similar conclusions were drawn by Kwiatkowski, 2021 in his study on the role of a regional BSS in small towns. Individual communes, due to their function, also saw tourism potential in the introduction of the system, which is consistent with the findings of Kaplan et al., 2015; Yang et al., 2021. The largest cities further indicate, in line with suggestions from de Chardon, 2017, that BSS was implemented only after the cycling infrastructure was in place. In small towns and rural areas, the situation was the opposite: here the BSS became an impulse to start a conversation about local cycling policy. The creation of a system in a metropolitan formula may also to some extent increase the bikeability of peripheral metropolitan areas, which, according to research by Saghapour et al., 2017, are characterised by lower bicycle and pedestrian accessibility than centres. With the introduction of the BSS discussed in this paper, electrically assisted bicycles were chosen as the means of transport. This decision was primarily driven by the need to increase the accessibility of this form of transport, which remains consistent with the conclusions and demands of the studies by Shaheen et al., 2010 and Wolf & Seebauer, 2014.

However, as shown by Bieliński et al., 2021; Suchanek et al., 2021, in the early days of the BSS, bike sharing did not replace car journeys as much as expected, even though MEVO was extremely popular and the bikes had electric assistance. MEVO bicycles, like traditional bicycles, mainly convinced existing public transport users. A similar substitution problem for BSSs, including non-electric ones, was demonstrated in earlier studies by Buck et al., 2013; Teixeira et al., 2021. However, the issue appears to be broader and may stem from the still heavily motorised transport culture in CEE countries (Parysek & Mierzejewska, 2016; Parysek, 2017; Kaplan et al., 2019). This result also appears to be the effect of low awareness of the benefits of cycling, including electric cycling, as confirmed in the study by Kwiatkowski et al., 2021.

7. Summary

The results show that the participating communes have clearly-defined goals for the implementation of the BSS and that these goals are aligned with their spatial and functional characteristics within the structure of the metropolitan area. The study has proven that a unified metropolitan bicycle system has the potential to fulfil its role in the large cities of the metropolitan core, in the small towns of the strong urbanisation zone, and in the villages of the external zone. In each case it will be a different role due to the specifics of each place, but the planned BSS has a great potential to meet the needs identified in the study area, i.e., in cities, towns, and villages alike. The study was limited by the early stage of project implementation during which it was conducted, which did not yet allow for the evaluation of the goals pursued. Nevertheless, this paper outlines what aims might guide the introduction of a system in a metropolitan area that is diverse in many ways. It also assigns the goals to the different zones of the study area. The results can therefore be useful for planners in the context of implementing large-scale metropolitan or regional BSS projects involving

more than one commune. Future research should focus on assessing whether the goals with which all partners entered the metropolitan BSS have been met and whether MEVO fully addresses the needs of all participants in the project.

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