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PROBLEMS OF IMPLEMENTING THE MEVO METROPOLITAN BICYCLE SYSTEM

Abstract

The MEVO Metropolitan Bicycle is an innovative public bicycle system in Europe. So far, no system has been introduced that is based entirely on 4th generation electrically assisted bicycles. The MEVO fleet will ultimately consist of 4080 bicycles, whose power supply is transferred from the batteries replaced by service technicians. Currently, 30% of the target fleet operates in the area of 14 cities and municipalities. The launch of the system revealed a number of problems that have not yet found practical and effective solutions. The article presents the premises for creating the system in the Gdańsk–Gdynia–Sopot Metropolitan Area. Problems related to the launch and operation of MEVO in the first three weeks of operation, which affect the low availability of functional bikes have been discussed. Solutions have been proposed that, when properly implemented, can cause MEVO to become not only a model public bicycle system, but also an inspiration for other European cities to use such a solution.

Keywords: transport, bicycles, urban transport, metropolitan areas
JEL: R40

Introduction

One of the ways of sustainable transport development in cities is the development of bicycle transport, which could replace at least in part transport by road transport. The effective cycling policy pursued for many years has allowed the city of Gdańsk to achieve a bicycle travel ratio of 6% of all trips in the city. This result gave Gdańsk a place in the forefront of Polish cities in this respect. Sharing good practices is one of the fundamental principles of metropolitan cooperation. For several years, bicycle communication has been developed not only in Sopot or

Gdynia neighbouring Gdańsk, but also in smaller cities such as Tczew. Previous experience in implementation brought various effects, but on their basis the concept of the MEVO Metropolitan Bicycle was developed in and around the Tri-City.

The MEVO Metropolitan Bicycle is the largest and most modern 4th generation public bike system in Europe. 4080 bikes forming the MEVO fleet are equipped with an electric motor, which supports the ride of residents of the Metropolitan Area, especially on hills. Bicycles are equipped with GPS and GSM modules, which allows to leave the bike not only in dedicated stations, but also in any place. The system operates in 14 communes and cities: Gdańsk, Gdynia, Sopot, Tczew, Pruszcz Gdański (city), Puck (city), Władysławowo (commune), Reda, Rumia, Sierakowice (commune), Sominino (commune), Stężyca (commune), Żukowo (commune) and Kartuzy (commune). Until now, the Tri-City Agglomeration and neighbouring Communes, which together form the Metropolitan Area Gdańsk–Gdynia–Sopot, were the only such large urban area in Poland without a public city bike system. The introduction of MEVO bicycles has met with great interest from the beginning. When the system was launched after more than 4 months of delay, within 2 weeks nearly 50,000 users joined it. The introduction of an innovative solution, unprecedented in Europe, and also most likely in the world, has revealed, however, a number of problems that disrupted the use of the system.

The purpose of the study is to analyze problems that occurred at the implementation stage and in the first weeks of operation of the MEVO Metropolitan Bicycle System and to identify solutions that will allow the system to function properly in the future. Solving current problems will create opportunities for dynamic development of bicycle transport in the studied area, enabling sustainable transport development.

1. Methodology and theory

The materials available were used to prepare the article, including A Conceptual Study of the Metropolitan Bicycle System for the Gdańsk-Gdynia-Sopot Metropolitan Area or the Strategy for Transport and Mobility of the Metropolitan Area until 2030. Internal documents of the Gdańsk–Gdynia–Sopot Metropolitan Area and access to the MEVO Metropolitan Bicycle System Report System were used to analyze problems, users' opinions and own work experience related to system startup. In the future, it will be crucial to examine the motivation of using the MEVO System by users and to check the impact of the actions proposed to the Operator and the actions taken by him on the proper functioning of the MEVO Bicycle System.

2. Expected results

Analysis of previous experience has shown that the main problems of development of the Mevo bicycle system are:

– low bike availability;

– problems with charging batteries;
– technical defects;
– problems with the relocation of bicycles.

3. Factors hindering the development of bicycle transport

The main factor hindering the development of bicycle transport in the area is the geographical location and the lay of the land. It is also widely believed that the barrier to implementing bicycle transport is the climate and varied weather.

The Gdańsk–Gdynia–Sopot Metropolitan Area (OMGGS) is located in the Pomeranian Voivodeship, in the northern part of Poland. It covers areas located on the Bay of Gdańsk, part of Powiśle, Żuławy Wiślane (with part of the Vistula Spit), Kashubian Coast, Kashubian Lake District, part of the Koszaliński Coast. The location of the Metropolitan Area within many physiogeographical units causes spatial diversity of the natural environment conditions in its area. The climate or hydrographic system is additionally affected by the location in the coastal area, which is characterized by the specific impact of the sea on the nature of the terrestrial environment. The majority of the Metropolitan Area is located in the lowlands crossed by deep river valleys. It should be noted, however, that there are both depressive areas and those whose absolute height exceeds 100 m a.s.l. (OMGGS, 2015).

The climate of OMGGS is strongly dependent on the sea. Summer temperatures are therefore lower than the national average, further lowered by the blowing breeze. Spring temperatures do not start until May, but the autumn lasts quite a long time, whose temperatures are friendly to cyclists even until October. The biggest problem is strong winds. Depending on the season, it blows from different sides: in the summer from the west, in winter from the inland. Storms occurring here are also a characteristic element. The average annual temperature is about 7.5°C. The amount of precipitation ranges from 550 to 650 mm (OMGGS, 2015). In other Polish cities with bike sharing systems, the climate of OMGGS is the closest to Koszalin or Szczecin. The climate can also be compared with the cities of northeastern Germany, Scandinavia or Denmark.

To sum up, it can be stated that for most of the year – from April to October, there are very good or good climatic conditions. Conditions in March and October are acceptable, while in the winter months they depend on snowfall. The phenomena observed in Western Europe for years allow us to state that care for bicycle infrastructure in such a period encourages the use of bicycles also at minus temperatures.

Analysis of the geographical location shows that the area has favorable conditions for cycling. However, the problem is areas with significant elevations, i.e. above 20 m and land slopes, above 5% (OMGGS, 2015). In this case, it is advisable to use bicycles with electric motor. It could turn out that the inhabitants use a bicycle to ride "down". They would use other public transport to return to the upper terraces. The use of electric motor allows to reduce fatigue resulting from uphill driving. It is especially important in the case of elderly people or people with worse physical condition.

4. Factors conducive to the development of bicycle transport

The Gdańsk–Gdynia–Sopot Metropolitan Area comprises 57 local governments. 14 of them joined the project Construction of the Metropolitan Bicycle System OMGGS. Gdańsk is a major city, with 460,000 residents. In total, around 1 million people live in all municipalities participating in the project. This is a huge target group to which the MEVO bicycle is directed. 90% of the system (nearly 3700 bicycles) will be located in Gdynia, Gdańsk, Sopot and Tczew. The remaining 10% will be in smaller municipalities. It is worth emphasizing, however, that all municipalities involved in the project are located directly on active railway lines, which is a large generator of potential clients (OMGGS, 2017a).

In the entire Metropolitan Area, a large group of potential users of the system are students (in 2014 over 100,000) as well as university graduates who remained in the agglomeration – about 25,000 (EU-CONSULT, 2016). Students as people who are particularly susceptible to technological innovations, brought up in the spirit of sustainable transport development, will probably be the most willing to use the MEVO System. For them, a big convenience will be no need to bring bicycles from their hometowns and villages, and a lower cost of using a public bike than using your own bike.

The next group that will actively use MEVO will be people commuting to the integration nodes. Poor access to public transport in cities (especially in new housing estates) may prove to be a decisive factor stimulating the choice of MEVO as a means of transport to reach railway stations. It will be more attractive than traveling on foot, shortening the time of arrival and also saving strength. Using public bicycles will also be safer than leaving your own bike on the interchange (EU-CONSULT, 2016).

Employees of the rapidly growing sector of Business Process Outsourcing/ Shared Services Centers are also an important group that has a significant impact on the development of cycling. They are often convinced of the need to use alternative means of transport to the car, aware of the health benefits of this solution (EU-CONSULT, 2016). The experience of other Polish and foreign cities equipped with a public bike system allows us to assume that also in this case it will be a large group of stakeholders.

5. Previous experiences with public bicycles in the Metropolitan Area

Gdańsk, Gdynia and Sopot constitute the core of the Metropolitan Area. Until now, it was the only such large agglomeration area in Poland, in which there were no public bicycles. The only attempts were made in Sopot. In 2013, Nextbike piloted a city bike system there. However, the business model differed from other Polish systems in which local governments pay the operator for the operation of the city bike system. In Sopot, the city did not participate in costs. The operator's revenue was to be fees from users (PLN 4 residents of the Tri-City, PLN 8 remaining per

hour of using a bicycle) and advertising revenues (Karendys, 2015). In the second year of the pilot, Nextbike noticed that without the city's support the system could not work. However, the city did not agree to finance PLN 200,000 for 80 bikes located in 7 stations. Bicycle relocation was another problem. Residents of the upper terraces of Sopot willingly used them to descend to the lower terraces. In October 2015, the company decided to withdraw from Sopot. For 2 years of the Tri-City Bike (because this is how the bike was named in Sopot) 16,507 rentals and 5185 registrations in the system were recorded (Karendys, 2015).

It can be assumed that the desire to launch the Tri-City Bike only in Sopot was a marketing operation addressed by the operator to Gdynia and Gdańsk. If a public bicycle were to be adopted in Sopot and the city co-financed its maintenance, pressure would be put on other local governments to join the project. However, in 2014, the operator ceased operations in Sopot without selling the service of sharing public bicycles in neighboring cities (Karendys, 2015).

6. Delays in implementing MEVO

City bikes have been a dream of the Tri-City local government for years. Established in 2011, the Gdańsk Metropolitan Area Association was aimed from the very beginning to act to legalize the metropolitan association. The cooperation of many local governments, especially in the area of obtaining EU funds, allowed the implementation of many key infrastructure projects from the transport point of view. After the name was changed to the Gdańsk–Gdynia–Sopot Metropolitan Area, cooperation between local governments was strengthened. It allowed to start work on the Metropolitan Bicycle System. Work began in 2015, when the opportunity to finance the project from the funds of the Regional Operational Project of the Pomeranian Voivodeship for 2014–2020 appeared. In 2016, a Conceptual Study of the Metropolitan Bicycle System was created for the Gdańsk–Gdynia–Sopot Metropolitan Area. It was a document supporting decision making related to the shape of the future system. The study included the results of analyzes as well as system construction recommendations, taking into account organizational, technical and economic-financial aspects (EU-CONSULT, 2016).

The authors of the study proposed 6 variants of bicycle implementation, depending on the building density, intensity of travel flows and the character of the village. The assumptions were for 3rd or 4th generation bicycles, with a different number of bicycles, depending on the needs. The option of introducing a seasonal system in some areas was also considered (EU-CONSULT, 2016). As a result of surveys and studies, 14 self-governments confirmed their participation in the project, and 4 refused to participate without providing reasons (the rural commune of Pruszcz Gdański, Jastarnia, Wejherowo and Pszczółki). The concepts proposed by the authors did not provide for the introduction of one system in the entire area. In addition, the concept provides for the introduction of electric bikes only for long-term rental. It was recommended that such long-term rental be possible in areas where the elevation is more than 20 m and the slopes are greater than

5%. It was also recommended to introduce free travel time within 15–20 minutes (EU-CONSULT, 2016).

The introduction of different types of bikes under one system would certainly be a major obstacle for the residents of the metropolis. In October 2017, the OMGGS Board approved the recommendation of the Metropolitan Bicycle System team regarding fees. It was then decided that the system would be fully paid. This was to contribute to the reduction of MEVO operating costs and encourage the operator to actively seek customers, which would be reflected in maintaining high quality of the fleet and the entire system (OMGGS, 2017b). In November 2017, a decision was made to operate the system throughout the year. This recommendation was closely related to the promotion of year-round bicycle communication conducted by cities and the desire to transfer patterns from other European cities. It was established that from November to March users will have 1224 bicycles at their disposal, which is 30% of the total bicycle fleet (OMGGS, 2017c). Scientific research carried out in the first year of the winter operation of MEVO, combined with research carried out a year or two, will be particularly important. later to determine if weather conditions are actually a negative factor in the development of cycling in the Metropolis.

Until April 2018, work continued on the tender documentation. Bid evaluation criteria became an important element. In addition to the price, the following were assessed:

– number of additional bikes – over 3877 pcs;
– share of the electric bicycle fleet above the required 10%.

The contracting party did not impose on the potential operator how to charge the batteries. It is only stipulated that when docking stations are used, their minimum number must correspond to the number of stands that would be intended for conventional bicycles (OMGGS, 2018).

The tender was decided in June 2018. Table 1 presents the bids submitted in the tender. Two of the three bidders submitted a bid for 100% bicycles with electrical support. The contracting authority, Metropolitan Area, as a result of the proceedings selected the offer of NB Tricity.

Table 1. The offers submitted in the Metropolitan Bicycle System MEVO public procurement tender

Performer	Gross price for the order	Number of bicycles	Share of electrically assisted bicycles	Rating obtained
Full Speed Ltd., Dublin, Irlandia, Telfourth Ltd., Dublin, Irlandia, BleeperBike Ltd., Dublin, Irlandia	PLN 32,562,246.42	5000	10%	Offer rejected
Egis Bike Polska Sp. z o.o., Warszawa – Homeport s.r.o., Praga, BikeU Sp. z o.o., Warszawa	PLN 76,675,625.61	3900	100%	67.7
NB Tricity Sp. z o.o., Warszawa	PLN 40,272,906	4080	100%	100

Source: (own elaboration based on: OMGGS, 2018)

7. Delay with system implementation

Pursuant to the agreement, the MEVO System was to be launched by 18th November 2018. At the beginning of November, it was announced that the MEVO System implementation delay would be about 3 weeks and the system will be implemented on 9th December (Dziennik Bałtycki, 2018). The launch date was postponed several times. In January 2019, the company announced its readiness to approve the system. The acceptance tests carried out by the commissioning committee were completed with a negative result. A number of errors were identified. The main problem was the GPS system on bicycles. Wrong location of the signal transmitter caused incorrect indication of the location of the bicycle. In the case of 4th generation bicycles and a concept entirely based on correct location indications, this error was so serious that it was not possible for the system to be approved by users. The contracting authority also made a number of comments regarding the settlement of payments (wrong billing, wrong settlement of the time used in the subscription) and the operator supervision system (problems with calculating contractual penalties, problems with indicating available bikes, etc.) (OMGGS, 2019a). As a result of many changes and corrections related primarily to the operation of the GPS system, on 13th March 2019, the second test run was completed successfully (OMGGS, 2019b). The MEVO System was launched on 26th March 2019 in Sopot. From that day on, residents of the Metropolis can use the most modern bike sharing system in Europe.

8. Problems with the functioning of the MEVO System

The MEVO system was a long-awaited new means of communication in the Gdańsk–Gdynia–Sopot Metropolitan Area. Until 16th April 2019, 6,9882 people registered in the System. 163,764 rentals were recorded (OMGGS, 2019c).

Compared to the Tri-City Bike operating in Sopot in 2013–2015, it can be stated that within 22 days there were 1347% of registrations made within 2 years in Sopot alone (Karendys, 2015). In 22 days, 1943 Sopot residents registered in the MEVO system. There were over 33,000 registrations of the residents of Gdańsk. However, problems in the functioning of the system, such as:

– low bike availability;
– problems with batteries;
– technical defects;
– problems with the relocation of bicycles

caused that from 5th April 2019 (i.e. after 12 days from the system start), the Operator blocked the possibility of making payments in the system, which does not allow new MEVO users to register in the system (OMGGS, 2019c).

The main problem faced by the MEVO System Operator is ensuring adequate availability of MEVO Bicycles. A working bike is considered an available bike, with a battery charged at the level of minimum 20%, which you can book and rent.

Figure 1 presents the MEVO bicycle availability indicator in the whole system. Until the second stage of the system was launched, the total number of bikes

entered into the system was 1224. The figure shows that for most days the availability of functional bikes fell below 50%. On 31st March availability was 0%, due to the system being turned off for users on that day.

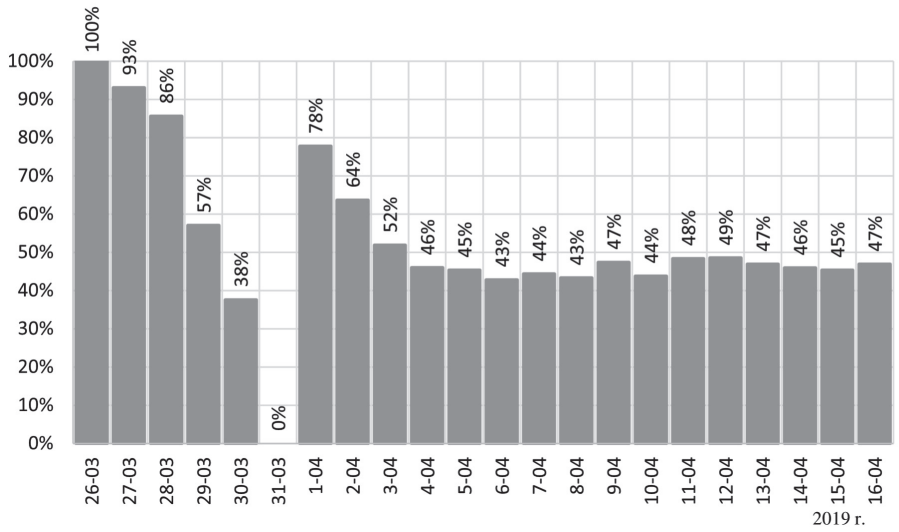

Figure 1. Availability of SRM MEVO in the period from 26th March 2019 to 16th April 2019 (in %)
Source: (own elaboration based on: OMGGS, 2019c)

Statements issued by the Operator and the Gdańsk–Gdynia–Sopot Metropolitan Area show that the operator is completely unable to deal with the issue of battery charging. The introduction of a system in which the power supply is assisted by batteries replaced by service technicians was quite a risky operation. At the beginning, the operator anticipated 100 chargers for charging the batteries and only 1000 spare batteries for 1224 bicycles scattered throughout 14 municipalities. However, the Operator did not foresee such huge interest in bicycles. There were 163,764 rentals in 22 days. On average, each bike is used 6.08 times a day, when in Warsaw in the 2018 season bikes were rented on average 4.4 times a day, and in Łódź 3.93. However, these statistics should be interpreted differently. Because most of the time the availability of bikes was at the level of 50%, which requires calculations to take the average number of bikes available at the level of 612. As a result, the actual rental rate was 12.16 bike rentals per day. Meeting such huge needs with the assumed number of chargers and spare batteries turned out to be very difficult.

It should be added that each day, when the availability of bicycles falls below 50%, the system is considered inoperative, a contractual penalty of PLN 100,000 is imposed on the Operator (OMGGS, 2019).

Another problem is technical defects of bicycles as well as acts of vandalism. Breaking of supports were observed in many bikes. This may be due to defective welds. Figure 2 shows an example of a broken support. It can be seen that it breaks exactly in the place where the fastening element is welded to the bicycle frame.

It is also problematic that a bicycle fender is attached to the same element. Riding such a bike is possible, but it hinders safe parking of the bike. A faulty bike must be taken to the service. Several hundred such damage causes that bicycles are not available to users. In addition, system users contribute to many damages. The operator reports many defects related to damaged wheel rims, broken inner tubes. This is closely related to the unregulated bicycle ride in 2 people, or to the curb of an accelerated bicycle. As a result of such behaviour, one of the bikes broke the frame and the bike fell apart in half (OMGGS, 2019c). Vandalism is another problem. It happened that the bicycle was drowned in the water reservoir, tires, saddles, pulled out saddles and braking system elements were cut. Such user behavior also negatively affects the availability of functional bicycles.

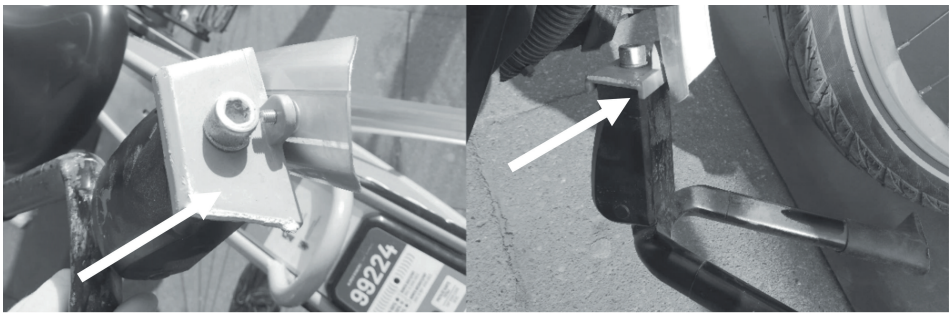

Figure 2. A broken support in a MEVO bicycle
Source: (own elaboration)

The Operator's major negligence is the relocation of bicycles. According to the agreement, between 3.00 and 5.00 each day, the condition of bicycles at each station should be within 30–200% of the base number of bikes assigned to a given station. It should be emphasized, however, that the contract also regulates the number of bicycles in each municipality belonging to the system. The relocation and the mentioned filling rates of the station refer to each commune separately. Each municipality must have a basic number of bicycles assigned to it each day. This means that if bicycles are moved between cities, the operator must relocate them to the appropriate municipalities overnight (OMGGS, 2018). The worst situation is in Gdynia, where the availability rate often falls below 40%. This is due to frequent travel on the Gdynia–Sopot/Gdańsk route (OMGGS, 2019c).

Problems with the functioning of the system caused that on 5th April 2019, the Operator blocked the possibility of making payments for the use of services. The Operator's decision was related to the desire to limit the number of system users to restore the expected level of system quality as soon as possible (Nextbike, 2019). The operator's decision was unilateral, the Metropolitan Area did not agree (OMGGS, 2019d). The effect of this is the lack of registration by new users (caused by the inability to make the initial payment needed to activate the account) and the inability to top up existing users after using existing ones.

Many problems can also be related to not starting the II stage of MEVO. According to the contract, it should be launched on 1st March 2019, which would increase

the number of bicycles to 4080. For the delay in starting the first stage, the Operator paid a fine of PLN 900,000. For each started month of delay in the implementation of the second stage a penalty of PLN 300,000 is charged, with the proviso that the maximum penalty amount is PLN 900,000 (OMGGS, 2018).

The Contractor's problems may also be confirmed by personnel changes in the company's Management Board. On 1st April 2019, the Chief Financial Officer – Dariusz Komorowski (Bankier, 2019) resigned from the board. On 16th April 2019, there was a change in the position of the President of the Management Board. The Supervisory Board dismissed the current president Robert Lech, and his place was taken by the owner of the company's main shareholder – Paweł Orłowski (Money, 2019). A situation in which the chief financier of a company leaves in one month, and then the president is dismissed, may indicate problems in managing the company.

9. Proposed solutions to improve the operation of the MEVO system

The fact that MEVO is Europe's first generation IV public bike system, entirely composed of a battery-operated electric fleet, means that it is not possible to take advantage of ready-made solutions to the problems encountered.

The main problem is logistics. The operator must absolutely increase the battery charging efficiency. To do this, additional chargers and batteries need to be purchased. To ensure an adequate buffer for spare batteries, an indicator of 1.5 batteries per bike would be adequate. This would save 50% in the event of a loading or distribution problem. When promoting an ecological means of transport, the Operator should also ensure that batteries for bicycles, especially in city centers, are distributed with cargo bicycles. The location of most stations along bicycle routes gives the chance to quickly move around the city, avoiding congestion. Replacement of discharged batteries during peak hours in city centers inaccessible to vehicles (e.g. Gdańsk, Puck, Tczew) causes a loss of time to enter by car. The use of cargo bikes would contribute to a more ecological perception of MEVO, as well as saving time and finances (less vehicle use). The Operator's mistake is also a small number of battery charging points. For Gdynia, Gdańsk and Sopot, charging takes place at the Energa Stadium in Gdańsk and at Ergo Arena on the border of Gdańsk and Sopot. The distribution of batteries from these two places is time consuming. The optimal solution would be to create cabinets for charging batteries located in several places in cities, from where service technicians could take charged batteries and leave empty. From the information obtained from the Operator, it appears that such action is planned, but no specific date for such a solution is given. The operator should also use the parking space of the bike for mass charging. In Gdańsk, such places can be seen at large office complexes (even around 70–80 bikes between 9 a.m. and 1 p.m.) or universities (around 20–30 bikes). Such a large number of bikes at one station allows for a quick battery change operation on many bikes, which will allow to maintain the appropriate level of charge in the afternoon peak.

Charging batteries in communes with a small number of bikes is also problematic for the Operator. In this case, it would be optimal to establish cooperation with local entrepreneurs. From the economic point of view, it is not profitable for a service technician to travel from Żuków to Somonin (approximately 30 km), where there are 3 bikes. The operator pays a fine of PLN 50 for every hour over 12 hours of flat battery. The involvement of local entrepreneurs would be optimal from the point of view of project finances. This model is currently functioning in Tczew, where Tczew Bicycle Couriers were involved to replace the battery. These people use cargo bikes to change batteries at MEVO every night. Due to such activities, the system operation in Tczew can be observed at the level of over 90%. Other cases are related to mechanical damage, for which this service is not responsible.

Cargo bikes should also be used by the mobile service for replacing damaged wheels, tires, and inner tubes. It is a task that does not require taking the bikes to the service in any case. This would also allow more employees to be employed without having a driving license. In this way, the company could also improve its image. It is also necessary to carry out the action of strengthening the fixing of bicycle supports. The number of damaged welds may indicate some manufacturing defect. It is also important to properly educate users on how to pull the bicycle off the stand, which will lead to a smaller scale of damage. The operator must also increase the number of working technicians so that any damage is repaired as soon as possible. For this it is also necessary to cooperate with local bicycle services. The solution to many problems would also be to start the second stage of the System as soon as possible, which would increase the number of bikes. Solving these problems will also improve the company's financial condition. Penalties charged each day for a non-functioning system are PLN 100,000. With a monthly income of PLN 60,639 gross due to performance of the contract, assuming that if the system does not work properly, the proceeds from the sale of ads and subscriptions will not be satisfactory, the company may face bankruptcy (OMGGS, 2018). The black scenario is the termination of the contract with the Operator, which may cause that the Metropolis will be able to forget about the public bike again, until a new operator is selected.

Summary

The MEVO Metropolitan Bicycle System is a long-awaited supplement to public transport in the Metropolitan Area. This can be demonstrated by the huge interest of system users. Unfortunately, the problems appearing in the first weeks of the system's operation cause a negative perception of the system among users. Ensuring the right level of available bikes is key to ensuring the success of this system at the moment. The operator must improve the logistics of charging and replacing batteries and the service of damaged bikes as soon as possible. In the event that the Operator does not implement the recommendations issued by the Gdańsk–Gdynia–Sopot Metropolitan Area, it may turn out that a large outflow of users will be noted, which may adversely affect the company's financial condition.

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