JEE Journal of Ecological Engineering

Journal of Ecological Engineering, 2025, 26(10), 227–237
https://doi.org/10.12911/22998993/205541
ISSN 2299–8993, License CC-BY 4.0

Received: 2025.05.16
Accepted: 2025.07.15
Published: 2025.07.22

Analysis of tools supporting public transport travel in Lublin, taking into account a dedicated solution

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ABSTRACT

Climate change resulting from CO_2 emissions has been an extremely important issue in recent years. Concern for the environment is becoming an increasingly important challenge facing modern society. One of the solutions to reduce greenhouse gas emissions is to develop the availability of public transportation. Encouraging city residents to leave their private cars and use public transportation can have a positive impact on the environment. However, the development of an accessible network is only one step in encouraging the use of public transportation. Nowadays, the vast majority of society makes conscious use of new technologies. Therefore, it is equally important to provide solutions that will allow a quick and easy way to check schedules, find an interesting connection and purchase a ticket. The article will present IT tools to support the process of traveling by public transport in Lublin.

Keywords: public transport, passenger, Lublin, application.

INTRODUCTION

Sustainability is the concept that the needs of the present generation must be met without diminishing the chances of meeting the needs of future generations (Czop et al., 2018, 2021) Sustainability is closely related to the circular economy as an industrial system that is planned and designed to be restorative and regenerative (Ciuła et al., 2024, 2022; Przzydatek, 2017). The EU is paying special attention to the concept of sustainable transportation because heavy transport generates 19.4% of CO_2 emissions attributable to the entire transportation sector (Gaska et al. 2021; Balcerzak et al., 2014; Kochanek et al., 2025). A massive shift to alternative fuels is also hampered by technological issues. Road transport is closely associated with the release of PM 10 and smaller particles into the environment, which has extensive health effects on socjety (Gronba-Chyła et al. 2025, 2024, 2020).

Numerous steps are being taken in the transportation industry, including in freight and passenger transportation, to lessen the detrimental effects of urban mobility on the economy, the environment, human health, and life (Kirchherr et al., 2027). They include a wide range of topics, such as the advancement and promotion of public transportation as a way to make better use of road networks and offer more socially just and environmentally friendly mobility than private automobiles. Limiting the growth of private vehicle transportation, combining various forms of transportation, making sure that transportation tasks are distributed logically among the different modes of transportation, creating new environmentally friendly delivery and transportation methods and technologies, encouraging alternative modes of transportation in cities, and altering user behavior and habits (Haghshenas, et al., 2012).

Urban settings in both wealthy and developing nations have grown less sustainable and more car-dominated over the past few decades. Transportation issues, such as pollution, traffic congestion, accidents, deteriorating public transit, environmental damage, climate change, energy depletion, visual intrusion, and inaccessibility for the urban poor, have rapidly increased in cities,

especially in developing nations (Leurent et al. 2011; González-Palencia et al. 2014). Some cities in more developed nations, especially those in Northern Europe, have seen a trend of taking back urban space from automobiles, prohibiting them from driving in some downtown districts, and/or imposing various restrictions on them. Public transportation based on roads or trains should be prioritized in medium-sized emerging cities (Kin 2017 et al.). Streetcars, trolleybuses, and eastern European streetcars that follow other traffic on city streets fall under this category. Since public transportation vehicles are fueled by electricity from overhead lines, they can be deployed on city streets and follow traffic patterns (Pojani et al., 2015). They have an electrified third rail, which gives them an advantage over subway systems, which need completely segregated traffic lanes. Public urban transportation is only available in larger cities in underdeveloped nations, but it is expanding quickly in industrialized cities with less traffic in the corridors. Public transportation construction and operation costs vary greatly (Ricci et al. 2017).

Enhancing parking costs or public transit options are two ways to affect the choices made by users of the transportation system (Kendall et al. 2015). Nevertheless, these are largely passive measures that target sizable, anonymous populations without thoroughly identifying each person's wants and expectations (Lejda et al. 2017). Reaching each individual user of the transportation system and persuading them to break their current connection habits appears to be the key in the interim. The experience of the last few years demonstrates that there are limited opportunities for the rapid growth of mass transit and road infrastructure, even with access to European Union money (Tomanek et al., 2017). In the meanwhile, it would be a mistake to put off fixing transportation issues until the investment program is finished because the needs of system users are so enormous. In the modern world, urban logistics is essential to building green, socially conscious metropolises that grow sustainably. The establishment of contemporary, widely distributed mass transit networks that enable all inhabitants to swiftly and easily access the city core has been essential from the beginning of the reurbanization era (Eccarius et al. 2020; Hardt et al. 2019). In the EU, urban and suburban buses account for 32.1 billion passenger trips annually, or 55.7% of all public transportation trips. An essential component of the multimodal mobility chain is buses.Buses are an important link in the multimodal mobility chain (Melo et al. 2017). They can and should be used as a tool for electromobility since they are also used to establish sustainable transportation regulations (Choubassi et al. 2016). The following information demonstrates the significance of buses in this context. Buses alleviate traffic congestion since one bus can replace thirty cars on the road (Iwan et al. 2017). Furthermore, city buses have been designated as a priority area for electrification due to their regular routes, which enable smaller batteries and prearranged infrastructure for charging (Jacyna et al. 2013). Today, most major metropolitan areas are developing intelligent transportation systems that provide travelers with real-time information (Olsson et al. 2012).These systems can provide information on how long it takes to get to the center, when the next bus will arrive, which arteries are least congested and which central parking lots have available spaces (Triantafyllou et al. 2014) Electromobility in a broad sense is becoming an important solution for building sustainable transportation systems in urban areas. Electromobility is increasingly appearing in the transport policies of the EU and individual member states (Goodchild et al. 2018). It is considered one of the most important tools in efforts to reduce the negative impact of transportation on the environment (Huang et al. 2017). This strategy includes simplifying the fare structure. These improvements remove barriers to accessing public transportation, encourage participation in monthly ticket programs, and potentially serve as new sources of revenue for transit agencies (Zhou et al. 2016).

LUBLIN – CHARACTERISTICS OF PUBLIC TRANSPORT

Until 2009, public transportation in the Lublin area was provided by Miejskie Przedsiębiorstwo Komunikacyjne Sp. z o.o. and private carriers, which had the necessary licenses to provide services on selected lines. Differences in ticket tariffs were characteristic. One-time (or temporary) and season tickets, distributed at ticket offices, kiosks and other sales points, were honored in MPK Lublin vehicles. Private carriers, on the other hand, required payment in vehicles. This would be particularly inconvenient for passengers with long-distance tickets. Timetables for

key lines such as the then 10, 18 and 26 repeatedly included both MPK Lublin vehicles and private carriers. This resulted in situations where a passenger holding a monthly ticket had to pay an additional fee in a private carrier's vehicle or wait for the next course, operated by MPK Lublin. In 2009, the Public Transport Authority was established, whose main purpose was to coordinate and manage public transportation in Lublin. The most important change concerned private carriers - they could no longer provide transportation services and sell tickets directly to passengers. ZTM in Lublin became responsible for the carriers' billing. From the passenger's perspective, on the other hand, the aforementioned problem disappeared - the carriers selected in the tender had to adapt their vehicles to ZTM requirements (city colors, ticket punchers) and fully honor the ticket tariff set by ZTM. In 2024, the Public Transport Authority was merged with the Road and Bridge Authority. Since 01.07.2024, the unit has been operating under the Zarządu Dróg i Transportu Miejskiego. Among the tasks of ZDiTM is the management of the route network, tenders for the provision of transportation services or infrastructure management. Currently (April 2025), passenger transportation services in Lublin are provided by three carriers: MPK Lublin, Irex and Lubelskie Linie Autobusowe.

Lublin is one of 3 Polish cities that have an active trolleybus network. Vehicles of this type are in the fleet of MPK Lublin. The use of trolleybuses is of particular importance in the context of sustainable transportation. However, it should be emphasized that trolleybuses are not the only ecological public transport vehicles in Lublin. In recent years, the infrastructure has been developed to allow electric buses to operate connections. Chargers have been installed on selected loops, allowing electric buses to be recharged. Lublin has 58 bus lines (including special lines) and 11 trolleybus lines. Table 1. presents the types of vehicles that can be found on the streets of Lublin.

Based on the data in Table 1, it can be concluded that a significant percentage of the fleet consists of non-fuel vehicles. The fleet serving public transportation in Lublin includes almost 38% of vehicles, using electric or hydrogen propulsion. The largest percentage, more than 26%, are trolleybuses, which appeared on the streets of Lublin as early as the 1950s. The developed trolleybus network and the gradual implementation of electric and hydrogen-powered buses prove that the issue of sustainable transportation is important in the context of the planning and development of the public transportation network in Lublin.

Table 1. Fleet of public transport vehicles in Lublin

Type	Count	% of all vehicles
Trolleybus	99	26.26%
Bus	234	62.07%
Electric bus	40	10.61%
Fuel cell bus	4	1.06%

TECHNICAL ASPECTS OF THE ANALYZED TOOLS

Nowadays there are many tools to support travel by public transport. They are developing over the years, taking into account a growing number of Polish cities. The current situation in the software market and the specificity of such solutions makes the most obvious technologies used for implementation are web technologies and applications dedicated to mobile systems. Web applications require a web browser (Microsoft Edge, Opera, Chrome, Mozilla Firefox, Safari, etc.) to function properly. The most user-friendly applications may be those dedicated to mobile systems. As for mobile systems in 2025, we can talk about the Android operating system (by Google) and Apple iOS. Quite popular in the past, the mobile system by Microsoft (Windows Mobile / Windows Phone / Windows 10 Mobile) in 2020 has been declared undeveloped and unsupported. Currently, its market share is negligible (Teodorescu et. al. 2023). Table 2 and Figure 1 show the share of each operating system in the operating system market.

Based on the data in Table 1, it can be concluded that in the last few years the mobile systems market has been divided between Android and Apple iOS. Therefore, the analysis of available tools will take into account the availability of a dedicated application for one of these two systems.

TOOLS SUPPORTING PUBLIC TRANSPORT TRAVEL IN LUBLIN

As it has been mentioned, on the market you can find many solutions, enabling you to support travel by public transport. The solutions available

Table 2. Mobile systems market share in years 2019–2025

Year	Android	iOS	Windows	Others
2019	75.47%	22.71%	0.21%	1.61%
2020	73.06%	26.28%	0.06%	0.60%
2021	71.89%	27.34%	0.02%	0.75%
2022	71.47%	27.85%	0.02%	0.66%
2023	70.26%	29.02%	0.02%	0.70%
2024	71.56%	27.81%	0.02%	0.61%
2025	72.02%	27.53%	0.01%	0.44%

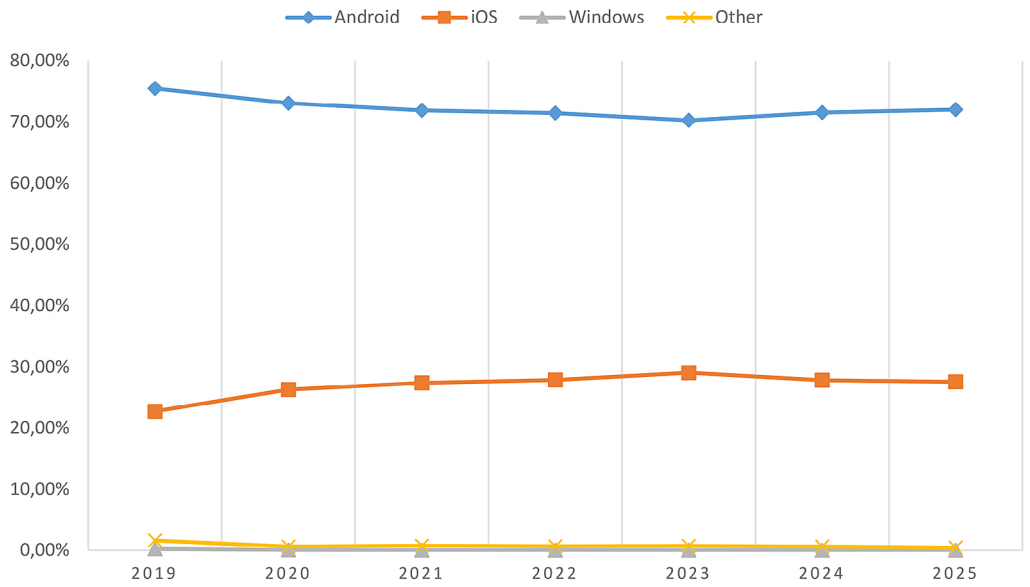

Figure 1. Mobile systems market share in years 2019–2025
https://gs.statcounter.com/os-market-share/mobile/worldwide

on the market differ in the functionality offered. Typical available functionalities are: checking the timetable, planning the route, purchasing tickets and checking the current location of the vehicle. Lublin has a Passenger Information System (SIP), which allows passengers to check where a vehicle is currently located. ZDTiM indicates on its official website several solutions that passengers can use. A summary of available solutions is shown in Table 3.

Lubika

An integrated platform prepared specifically for the city of Lublin. It is the most advanced tool related to public transportation in Lublin. With the use of this tool, passengers can perform many travel-related activities, such as route planning taking into account the type of vehicle (buses / trolleybuses), purchase of bus stop tickets / single tickets / timed tickets / long-distance tickets, checking the expiration date of tickets or an interactive map of bus stops and ticket sales points. Significantly, Lubika has both mobile applications, allowing for quick purchase of tickets and showing them in case of inspection, as well as an online Passenger Portal. The Passenger Portal is a web-based application that allows users to view registered carriers, electronically recharge their wallets, purchase season tickets or view transaction history. In addition, the Passenger Portal allows you to submit various applications, related to tickets (e.g., the issuance of a Lublin City Card tag – entitling user to discounts on the purchase of long-term tickets (https://lubika.ztm.lublin.eu).

Jakdojade.pl

A travel planning platform developed in 2006 by students as an engineering project. The

Table 3. Travel support tools available for the city of Lublin suggested by ZDTiM Lublin

No.	Name	Short description
1	Lubika	An integrated tool in the form of a dedicated mobile app and a web app
2	Jakdojade.pl	Trip planning platform to purchase tickets and track vehicles
3	moBILET	Ticket purchase application
4	mPay	An application that supports various payments, including the purchase of public transportation tickets
5	SkyCash	An application that supports various payments, including the purchase of public transportation tickets and parking fees
6	Zbiletem.pl	Application for the purchase of single and timed tickets
7	GoPay	Application to purchase public transport tickets
8	myBus online	A platform to track the current position of vehicles, plan routes and check schedules
9	Rozkład	Java application for that allows to check the schedule offline, provided by ZTM Lublin
10	Iplaner	Unavailable planner
11	Moovit	Application combining official public transport data with crowdsourcing data
12	takeanddrive	Application to support carsharing, vehicle rental and public transport travel

original goal was to prepare an application that would respond to the needs of a person starting life in a city foreign to him and needing accurate navigation to his destination. Therefore, the app was initially designed for routing public transportation. 2 years later, the app was transformed into the first publicly available travel planning service. In the following years, the project developed: dedicated apps for Android (2011) and iOS (2012) were created. Support for more cities and a ticket purchase module were introduced (2017). In 2019, functionality was implemented to track delays live. In selected cities, the service provides functionality for purchasing season tickets (from 2021). From 2022, the ability to search for train connections was also introduced, and a year later – the sale of PKP Intercity tickets (https://jakdojade.pl).

moBILET

The application was created in 2007 in Poznan. It was initially designed for the purchase of parking tickets without the use of parking meters. The mobilet application was a major innovation from the beginning, as the smartphone market was just gaining popularity at the time of its inception. Mobilet is an application that allows the purchase of public transportation tickets and the processing of parking fees in more than 200 localities in Poland. In some of the localities both services are available, in others – one of them. It is worth noting that the mobilet service has also been available in Germany for several years. As in the case of Poland, purchases of various types of tickets are available, including parking fees, public transport tickets. In addition, other services are provided in Germany, such as renting bike boxes or paying for electric vehicle charging (https://mobilet.eu/pl/).

mPay

An application developed by mPay S.A., a company founded in 2003. The mPAy company from 2003 to 2006 worked on the concept of a system allowing payments to be made via cell phone. In 2007, the company managed to obtain approval from the President of the National Bank of Poland to settle payment transactions. This involved obtaining the status of a clearing agent. In the same year, mobile payments were launched, using USSD codes for the mobile operator Plus GSM. In 2015, mobile applications for Android, iOS and Windows Phone were launched. A year later, mPay received the status of a National Payment Institution (granted by the Financial Supervision Commission). Currently, the service allows for various types of payments, including the purchase of public and intercity transportation tickets, the purchase of parking tickets, the execution of instant transfers or the payment of bills (https://www.mpay.pl).

SkyCash

Created in 2010, is an application that allows various types of payments. With SkyCash, it is possible to purchase public transportation tickets, parking tickets, bus and train tickets. In addition,

SkyCash allows the purchase of travel and communications insurance from the offerings of its partners. Additional services, in turn, include prepaid services – GSM top-ups, top-ups for gaming platforms (such as Xbox Live and Steam) and prepaid electricity meter top-ups. SkyCash is a comprehensive platform and the availability of services depends on the scope of the agreement with the selected partner. Among SkyCash's partner cities is the city of Lublin – in the case of Lublin, the application allows the purchase of public transportation tickets and the payment of parking fees (https://www.skycash.com).

Zbiletem.pl

An application developed since 2015, designed for the purchase of single and timed tickets. Payment for tickets can be made in several ways – using prepaid wallet, Google Pay, Apple Pay, payment card or Blik. Currently, the zbiletem.pl app is available in more than 60 cities in Poland (https://zbiletem.pl).

GoPay

An application that allows the purchase of public transportation tickets. It is worth noting that the app's authors have also prepared dedicated, more elaborate applications for Szczecin, Koszalin, Gniezno and Jaworzno (https://www.gopay.com/pl).

myBus online

An application prepared by Przedsiębiorstwo Zastosowań Informatyki TARAN Sp. z o.o. The most important part of myBus is the passenger information system. In the case of selected cities, the application allows users to track an interactive map of vehicles by line, thanks to GPS transmitters mounted in the vehicles. This is an extremely important functionality, which allows passengers to obtain precise data on connections and make decisions on route changes, if necessary. In addition, such functionalities as stop search, line search, stop map and trip planner are provided. It is worth noting that the planner has the ability to indicate the maximum number of transfers, which may be particularly important for some passengers. An interesting feature is the application's offline operation - after downloading the timetables of a selected city, the passenger can use the application without an Internet connection. Such a solution is useful in case of network availability problems. The application is divided into modules that can be implemented in a given city. In the case of the city of Lublin, the functionality of the planner is not supported (http://www.taran.com.pl/mybusonline/).

Rozklad

A simple application that allows you to check schedules offline. The application was dedicated to phones that support java applications.

Iplaner

ZDTiM's suggested mobile version of the trip planner, which requires Internet access. The app is no longer available.

Moovit

The app was created in Israel as a startup in 2012. It allows users to plan trips on various modes of transportation, purchase public transportation tickets, and track live vehicle routes. Users can view connections available at nearby stops. The planner allows users to define their place of residence, place of work or other favorite places, which contributes to the app's convenience. What is distinctive about Moovit is that the app is a combination of official data provided by operators and crowdsourcing data. Users can also send additional reports on, for example, the reasons for course delays. The solution comes in the form of a web application and a dedicated application for Android and IOS systems (https://moovitapp.com/pl).

Takenddrive

The basic functionality of Takeanddrive is the ability to search for available shared transportation (carsharing, electric scooters, bicycles). In addition, the application has been expanded to include the ability to check public transportation schedules and track travel routes. Worth highlighting is the functionality of the multimodal trip planner. This planner allows you to plan a trip around the city using both public transportation and vehicles available for rental (https://takeanddrive.eu).

COMPARISON OF APPLICATIONS SUPPORTING PUBLIC TRANSPORT TRAVEL IN LUBLIN

The selected applications were compared taking into account several categories. The first was the availability of apps dedicated to specific systems. Due to the negligible market share of Microsoft's mobile operating systems, Android, iOS and web applications were included in the analysis. The data is presented in Table 4. The availability of applications for a particular platform is marked with the number 1, none – with the number 0.

Analyzing the data in Table 4, it can be concluded that almost all of the analyzed solutions are available in a browser-based application and have dedicated apps for Android and Apple iOS mobile systems. From the perspective of daily use of the apps, the apps dedicated to mobile devices seem to be the most important, as they allow quick search for a vehicle, connection, purchase of a ticket or sharing a ticket in case of an inspection. However, it should be noted that web apps can be useful and convenient to use for operations such as creating a new account or topping up a virtual wallet. The Timetable and Iplaner apps received 0 points in all categories, as they could not be accessed.

In the next step, the applications were analyzed in terms of their functionalities available in Lublin. The analyzed functionalities were divided into several groups, concerning the ability to search for a connection, search for vehicles and stops and purchase a ticket. It should be noted that the applications were considered as a whole (some tools have extended functionality in the case of the web application). The result is presented in Table 5. Applications that are no longer available were omitted from the analysis.

Based on the data in Table 5, it can be concluded that in the context of the analyzed functionalities, the best application is Lubika. The good result of this application is related to the fact that it is a dedicated application for Lublin and its business requirements include the specification of public transportation in Lublin. However, it should be noted that in Lublin, in addition to the Lubika application, there is also a Passenger Information System, which has extended functionalities such as locating the vehicle, accurately displaying the route and displaying the time until departure. However, this system is independent of the Lubika application, so its functionality was not considered during the analysis. The functioning of the Passenger Information System in Lublin, however, has the effect that the functionality of the myBus Online application in Lublin is severely limited – this functionality has not been purchased (Figure 2).

The results of the analysis made it possible to divide the applications suggested by ZDTiM in Lublin into two main categories. The first is applications that have advanced functionality related to trip planning. The second group is applications designed primarily for purchasing tickets. The largest number of analyzed applications, designed for trip planning, have functionalities:

- possibility of locating the user,
- defining the start time of the trip,
- time of each travel part,
- total travel time.

Table 4. Availability of tools for selected platforms

No.	Name	Web application	Android	iOS
1	Lubika	1	1	1
2	Jakdojade.pl	1	1	1
3	moBILET	1	1	1
4	mPay	1	1	1
5	SkyCash	1	1	1
6	Zbiletem.pl	1	1	1
7	GoPay	1	1	1
8	myBus online	1	1	1
9	Rozkład	0	0	0
10	Iplaner	0	0	0
11	Moovit	1	1	1
12	takeanddrive	1	1	1

Table 5. Availability of selected functionalities in the analyzed applications

No.	Functionality	Lubika	Jakdojdae.pl	moBILET	mPay	SkyCash	Zbiletem.pl	GoPay	myBus online	Moovit	takeanddrive	Sum of apps
General												
1	Timetable	0	1	0	1	0	1	0	1	1	1	5
2	Map of available routes in Lublin	0	1	0	0	0	0	0	1	1	0	3
3	Map of available stops	1	0	0	1	0	1	0	1	1	1	6
Trip planning												
4	Possibility of trip planning	1	1	0	1	0	0	0	0	1	1	5
5	Defining the start time of the trip	1	1	0	1	0	0	0	0	1	1	5
6	Selecting a starting point from the map	1	1	0	1	0	0	0	0	1	0	4
7	Time of each travel part	1	1	0	1	0	0	0	0	1	1	5
8	Total travel time	1	1	0	1	0	0	0	0	1	1	5
9	Defining the maximum number of transfers	1	0	0	0	0	0	0	0	0	0	1
10	Defining the maximum transfer distance	1	0	0	0	0	0	0	0	0	0	1
11	Possibility of locating the user	1	1	0	1	0	1	0	1	1	1	7
12	Possibility of locating vehicle	0	0	0	0	0	0	0	1	1	0	2
13	Defining expected vehicle type (bus / troley-bus)	1	1	0	1	0	0	0	0	0	0	3
14	Defining of avoided lines	1	1	0	0	0	0	0	0	0	0	2
15	Suggesting the ticket required for the trip	1	1	0	0	0	0	0	0	0	0	2
Tickets												
16	Possibility to buy a single ticket	1	1	1	1	1	1	1	0	1	0	8
17	Possibility to buy a season ticket	1	0	0	0	0	0	0	0	0	0	1
18	Possibility to buy stop tariff tickets	1	0	0	0	0	0	0	0	0	0	1
19	Checking the history of purchased tickets	1	0	1	1	1	1	1	0	1	0	7
Sum of points		16	12	2	11	2	5	2	4	12	7	

Functionalities such as Defining of avoided lines and Suggesting the ticket required for the trip are only available in two cases. On the other hand, functionalities: Defining the maximum number of transfers and Defining the maximum transfer distance may be of particular interest to travelers, but are only available in the Lubika application.

It is worth noting that 6 of the 10 analyzed applications provided the functionality of displaying a map of available stops. Such a solution is very useful for travelers, as it allows them to

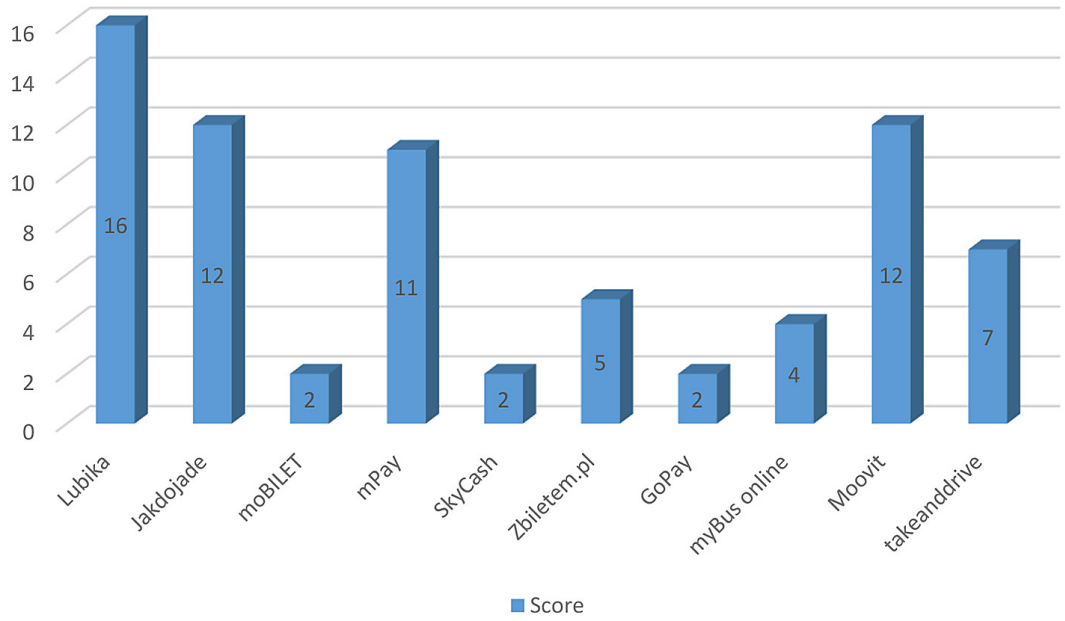

Figure 2. The result of the analysis of tools supporting public transport travel in Lublin

more quickly locate the nearest stop and verify the lines that use it. In addition, locating stops on the map is useful when traveling with transfers. The stops in Lublin have a specific way of naming – they have been combined into larger stop groups. Stops within a group use the same name, extended by an additional number. For example, in the vicinity of Rondo Lubelskiego Lipca '80 there is a group of stops „Rondo Lubelskiego Lipca". There are as many as 5 stops in the group – Rondo Lubelskiego Lipca 01, Rondo Lubelskiego Lipca 02, Rondo Lubelskiego Lipca 03, Rondo Lubelskiego Lipca 04 and Rondo Lubelskiego Lipca 05. These stops are at most 250 meters from each other, but moving between them can be time-consuming due to the need to use pedestrian crossings. The exact location of a stop on a map can greatly improve finding the right stop for a multi – stop trip.

Analyzing the second group of apps, dedicated mainly to ticket purchase, it should be noted that most of the available apps have the ability to purchase single tickets only. The purchase of long-distance and stop tickets (specific to Lublin) is available only in the Lubika app. This is one of the biggest advantages of the Lubika app. Bus stop fare is very attractive for passengers who use public transportation occasionally or use mainly short trips. When traveling on routes consisting of several stops, the fare under the stop fare is lower than the cost of time tickets.

CONCLUSIONS

In recent years, there have been significant changes in the approach to travel in Lublin. The network of connections has expanded and lines have appeared, connecting the city of Lublin with neighboring municipalities. The refreshing of the rolling stock implemented through the purchase of new vehicles, including electric buses, makes public transportation in Lublin more and more accessible and can be an alternative for people who use their own vehicles on a daily basis. It should be noted that recent years have brought many changes to the ticket distribution market. Kiosks, popular in the past, have been replaced by ticket machines (stationary or mounted in vehicles). The development of new technologies has led to a number of solutions appearing on the market, allowing to support public transport travel. Solutions suggested by ZDTiM in Lublin allow supporting various stages of travel - from checking the schedule, through planning the entire trip to buying a ticket. Particularly noteworthy, however, is the Lubika application, which was prepared in response to the specific needs of the city of Lublin. This application has the most extensive functionality, including the ability to purchase a season ticket online. The availability of multiple applications, supporting different elements of the travel process, should positively influence passengers' willingness to choose public transportation over private cars.

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