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THE QUALITY OF LIFE IN SUSTAINABLE URBAN MOBILITY PLANNING. THE CASE STUDY OF THE POLISH CITY OF PIOTRKÓW TRYBUNALSKI

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Summary: The quality of life is nowadays one of the leading socio-economic and political topics. On an urban level its importance is growing as the megatrend of urbanization is reconstructing the global map of megacities. By 2050, two-thirds of the global population will live in cities. Therefore quality of life, although difficult for objective measurement, is one of the most important issues in sustainable urban planning for cities. An important element influencing quality of life is ‘motorization’ with its positive and negative impacts. Using the example of Piotrków Trybunalski, a medium-sized Polish city that has already adopted the Sustainable Urban Mobility Plan, the evaluation of the quality of life is presented. Data collected in October 2019 was used. The residents were divided into segments based on intensity of their car usage. Particular segments are differentiated according to the modal split and daily mobility index of citizens. The assessment of the quality of life in Piotrków Trybunalski is quite similar for citizens with different access to car usage, although it has a tremendous impact on their modal split.

Keywords: sustainable urban mobility, quality of life, transport.

Streszczenie: Jakość życia jest obecnie jednym z wiodących tematów społeczno-gospodarczych i politycznych. W wymiarze miejskim jego znaczenie rośnie, ponieważ urbanizacja jako megatrend zmienia globalną mapę megamiast. Do roku 2050 w miastach będą mieszkać

dwie trzecie światowej populacji. W związku z tym jakość życia, choć trudna w obiektywnym pomiarze, jest jedną z najważniejszych kwestii w zrównoważonym planowaniu miast. Elementem wpływającym na jakość życia jest motoryzacja z jej pozytywnymi i negatywnymi skutkami. Na przykładzie Piotrkowa Trybunalskiego, miasta średniej wielkości, które przyjęło Plan Zrównoważonej Mobilności Miejskiej, przedstawiono ocenę jakości życia. Wykorzystano dane zebrane w październiku 2019 r. Mieszkańców podzielono na segmenty w zależności od intensywności korzystania z samochodu. Segmenty te wyodrębniono w związku z podziałem podróży i dobowym wskaźnikiem ruchliwości mieszkańców. Ocena jakości życia w Piotrkowie Trybunalskim jest dość podobna dla mieszkańców o zróżnicowanym zakresie dostępu do samochodu, który ma duży wpływ na podział podróży miejskich.

Słowa kluczowe: zrównoważona mobilność miejska, jakość życia, transport.

1. Introduction

The main goal of the paper is to present the links between quality of life and sustainable urban mobility planning using a “living example” of a city that has already adopted the Sustainable Urban Mobility Plan.

Therefore the main thesis of the paper is that quality of life, although difficult to measure objectively, remains one of the most important issues in sustainable urban planning for cities. The main thesis is supported by the following supplementary research questions, namely:

- Are there objective ways to assess the quality of life in a city?
- Is the concept of sustainable urban mobility linked with the issue of the quality of urban life?
- Does owning a car influence the assessment of the quality of life in a city?

To meet the above requirements, the paper is structured as follows. The introductory part presents the urban growth process. Then, the dilemmas and challenges related to measuring the quality of life are presented. The links between quality of life and sustainable urban mobility planning are discussed, before being illustrated by the case study analysis of one of a Polish city that recently (October 2019) adopted SUMP (Sustainable Urban Mobility Plan). The authors focused on the segmentation process based on access to a passenger car. The results are discussed according to the modal split and assessment of the perceived quality of life in the city of Piotrków Trybunalski. The main research methods included market research, literature review and case study analysis.

2. The process of urban growth

Urban growth is now a megatrend, leading to economic, social and environmental challenges on a global scale. Cities are responsible for around 70% of total emissions [C40] but they constitute only 54% of the world population [Ritchie, Roser 2019]. They are a crucial element of the global economy and their importance is becoming

even greater as the number of megacities is rapidly rising. In 2050, two-thirds of the total world population will live in cities, although 90% of the 2.5 billion of new urban inhabitants will come from Asia and Africa [UN 2019]. Urban growth is accompanied by the transition of cities from industrial to service and leisure functions and the growing significance of cyberspace for the locational decisions of business and households [Pacione 2009]; economic development is accompanied by urbanization [Sachs 2015].

The growing number of cities and their inhabitants create new challenges and opportunities for their citizens. Different aspects are being integrated into “quality of life” – an attempt to take into account various aspects of life in urban areas. The issue of quality of life has been present in economics since the 1950s. A. Sen listed the following factors that allow for the transformation of freedom into quality of life: political freedom, economic and social opportunities, guarantee of transparency and social security [Płachciak 2010]. A. Delbosch underlines the difference between ‘well-being’ and ‘quality of life’, explains that well-being reflects broader judgements about life structuring them into three main domains, namely employment, relationships and health [Delbosch 2012].

The quality of life assessment is a complex, interdisciplinary undertaking [Szołtysek (ed.) 2018] and contains objective elements (e.g. the situation on the labour market, level of remuneration, level of infrastructure and services development, air quality) as well as subjective, depending on a person’s personal situation (e.g. lifestyle, professed values, relationships with other people, personal safety). The complexity of issues related to quality of life is the reason why for many years attempts have been made to create an objective indicator of its measurement. Measures covering environmental issues are increasingly used to measure quality of life, although for indexes like the Happy Planet Index, they lead to the over-representation of the ecological footprint, favouring countries with less developed economies. Countries with higher human development indexes generally produce more carbon per capita and have higher ecological footprints overall [United Nations Development Programme 2019].

Moreover, the European Commission has stressed the need for the European Statistical System to use a multidimensional approach when defining and trying to measure quality of life, focusing not only on GDP related data [European Commission]. Quality of life is therefore a broader concept than economic production and living standards [Stiglitz, Sen, Fitoussi 2009].

Cities, due to their internal diversity and the frequent lack of comparable data, present an even greater challenge in comparing the quality of life. It should also be mentioned that three key areas in relation to the quality of city life, i.e. economic, social and environmental, are at the foundation of the concept of a ‘smart city’ [Melo, Macedo, Baptista 2017]. Other important aspects for the urban quality of life that are relevant for transport are accessibility and mobility as well as livability [Romão et al. 2018]. Quality of life is often linked to the idea of a sustainable city. The most

desirable attributes of sustainable cities might be seen in the features of a ‘compact city’ (high density, variety of functions, mixed and efficient land use, high accessibility, green spaces, active modes of transport and public transport) an idea that is presented as being the opposite of a ‘sprawling city’ [Mörtberg et al. 2017]. However, the process of transformation into a ‘compact city’ may result in a greater level of suburbanization that stimulates car-dependent mobility [Priemus, Nijkamp, Banister 2001].

Despite the abovementioned difficulties with measuring the level of quality of life, various rankings for cities in this area have been developed. One of the most recognized and comprehensive rankings is the Quality of Living survey developed by Mercer. This is an attempt to comprehensively present the quality of life in cities based on annual research on the quality of life in various regions of the world; 231 cities from around the world were included in the “Quality of Living” study in 2019 and 39 elements were taken into account, grouped into ten categories:

- housing,
- consumer goods,
- medical and health considerations,
- economic environment,
- schools and education,
- socio-cultural environment (media availability and censorship, limitations on personal freedom),
- recreation,
- public services and transportation,
- political and social environment,
- natural environment (climate, record of natural disasters) [*I am Expat*].

These elements allow for a comprehensive analysis of the living conditions in key metropolises of the world.

Table 1. Best cities to live in the ‘Quality of Living’ survey of 2019

Position	City	Country
1	Vienna	Austria
2	Zürich	Switzerland
3	Vancouver	Canada
4	Munich	Germany
5	Auckland	New Zealand
6	Düsseldorf	Germany
7	Frankfurt	Germany
8	Copenhagen	Denmark
9	Geneva	Switzerland
10	Basel	Switzerland

Source: [<https://mobilityexchange.mercer.com/Insights/quality-of-living-rankings>].

The capital city of Austria, Vienna, ranked the highest, and the top ten included eight cities from Europe, namely three from Germany (Munich, Düsseldorf and Frankfurt am Main) and three from Switzerland (Zürich, Geneva and Basel). The ranking includes two Polish cities, i.e. Warsaw and Wrocław, which took 82nd (79th in 2016) and 100th place (99th in 2016) respectively. Vienna, for the 9th time in a row, became the leader of the Quality of Living ranking. In particular, the city's strengths include political stability, a high level of health care and easily accessible transport [Mercer].

The Green City Index is another ranking that puts more emphasis on sustainability issues at an urban level. Developed by the Economist Intelligence Unit in cooperation with Siemens, it includes 30 indicators, which were divided into eight or nine categories depending on the region analyzed. The study covered capital cities as well as other cities important due to their size and/or economic importance. The 2012 study on Europe included categories such as emissions, the energy and housing sector, waste and land use, water management, air quality, environmental management and transport. The latter category included the promotion of ecological transport, a policy to reduce congestion, the use of means of transport other than a passenger car, and the size of the transport network as an alternative to road transport [Siemens 2012].

In 2012, 130 cities were analyzed of which a separate ranking was made for 12 German cities and 30 European capitals in Europe. Among ten cities with the highest environmental quality in Europe, three of them (Vienna, Zurich, Copenhagen) were also in the top ten best cities to live in in the 2019 Quality of Living ranking by Mercer. This shows that the broadly understood quality of the environment, including transport and mobility, has a great impact on the quality of life and on the perception of the city in an international dimension.

While some objections could be raised about the importance of individual indicators relating to transport, the rankings cited above indicate that the sustainable mobility sector has a significant impact on the perception of the city not only by 'internal users' (residents) but also by visitors and contributes to the international competitiveness of the city.

3. Sustainable Urban Mobility Planning and quality of life

The need for strategic planning of mobility issues in urban areas results directly from its importance for quality of life. The starting point for developing strategic documents in the field of urban mobility is the assumption that transport and mobility are not goals in themselves, but should contribute to achieving higher goals, such as quality of life and the well-being of urban residents. The aim of the authorities of each city is to improve the quality of life, which should generally take place in three spheres, i.e. social, economic and spatial [Wallington, Lambert, Ruona 2013].

Mobility is an interdisciplinary issue because it determines the availability of other ‘products’ offered in the city by various entities, both public and private. On the one hand, increasing the city’s accessibility contributes to an improvement in the quality of life, but after exceeding the optimum level it could be the source of a number of nuisances felt on a different scale by various groups of residents and users of urban space. A model approach to sustainable mobility should therefore cover issues of broadly understood development, quality of life, and the economic efficiency of the functioning of the mobility system [Gillis, Semanjski, Lauwers 2016]. Such scope is a source of difficulties in the objective assessment of different mobility-related undertakings, due to the blurred and broad definition of the quality of life [Suchanek 2019].

In conditions of the dynamic development and dominance of passenger cars, the issue of quality of life in cities takes on a new dimension, especially for elderly people [Hebel 2014; Hebel, Wyszomirski 2018]. Mass motorization has had both a positive and negative impact on the quality of life. The lifestyle of the inhabitants of modern cities has been dominated by passenger cars, leaving its mark both in the material sphere of cities (infrastructure), spatial (matrix of origins and destinations) and socio-economic (transport behaviour and automotive status). The negative external effects of transportation congregate in cities [Gössling et al. 2019] but their dynamics and drawbacks for the city residents are higher in the newly developed megacities of Africa, Asia and South America as limited budgets face rampant urbanization [Hoor-Ul-Ain 2019]. In recent times, attention has been drawn to the negative health impacts of traffic, including traffic accidents, exposure to air and noise pollution as well as exposure to local temperature rises, the reduction in green spaces and the loss of biodiversity [Khreis et al. 2016].

In Poland the development of mass motorization began following the country’s accession to the EU. The increased use of cars in urban trips in Poland is encouraged by [Wyszomirski 2017]:

- low parking fees,
- no fees for entering the center of a city,
- large number of parking spaces,
- lack of low emissions zones,
- lack of coordination of land use policy at a metropolitan level,
- priority for the development of road infrastructure.

The more cities are adapted to the needs of passenger cars, the more their quality of life decreases, which favours the migration of subsequent residents to the sprawling suburbs. The increase in the transport intensity of the settlement system is conducive to further irrational use of space, which in turn leads to consolidation of the “car-oriented” behaviour of city dwellers and neighboring territorial units.

Therefore many European countries have adopted regulations that are, to some extent, a rejection of the concept of “city for vehicles” [Makarova, Shubenkova,

Gabsalikhova 2017]. The most important tool of this concept is the Sustainable Urban Mobility Plan.

The starting point for developing a Sustainable Urban Mobility Plan should be the assumption that transport and mobility are not goals in themselves, but should contribute to achieving higher goals, such as quality of life and well-being of urban residents. Sustainable urban mobility plans are recommended by the European Commission as an effective tool for planning and implementing transport policies in cities [Okraszewska et al. 2018].

They are recommended as a guiding principles that can be adapted to the specific circumstances of the urban area [European Commission 2017]. "A Sustainable Urban Mobility Plan is a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles" [Rupprecht Consult 2019].

Planning of sustainable urban mobility is now commonplace within many EU countries, but plans as strategic documents have undergone a substantial evolution from typical 'infrastructural-oriented' towards complex cross-policy solutions, the main goal of which is to increase accessibility and quality of life in many aspects. "Its core goal is to improve accessibility and quality of life by achieving a shift towards sustainable mobility" [Rupprecht Consult 2019]. Moreover, monitoring should form an important element of each SUMP. As SUMP are now complex policy-supporting documents, they should include relevant measures of social, economic and environmental issues. They are not only important for monitoring but also in the decision-making process, supporting other tools like MCA (Multi Criterial Analysis) and CBA (Cost Benefit Analysis) [Urbanek 2019].

4. Introduction to the case study: Piotrków Trybunalski, Poland

The population of Piotrków Trybunalski, a city in central Poland, was 73,670 in 2018. In the period 2010-2018, the number of inhabitants decreased by 4%.

Piotrków Trybunalski is a city with a county status, which means that the local government is responsible for carrying out both municipality and county related tasks. This has a direct impact on the city budget, which includes revenue and expenditure for both levels of local government. In 2018, Piotrków Trybunalski's budget revenues reached PLN 432.7 million, while outgoings – PLN 471.3 million. The share of investment expenditure in the budget of 2018 was 18%.

The most important part of revenue was income based on the shares of local government in personal income tax (PIT) and real estate tax, which together accounted for over one-third of the total budget revenue. Piotrków Trybunalski's budget revenue is growing almost constantly (a trend characteristic for all cities with county status) and in 2018 reached PLN 5 847 *per capita* – an increase of 51% compared to 2010. Income from the share of local government in personal income

tax (PIT) per capita in 2018 amounted to PLN 1 337 and increased compared to 2010 by as much as 86%.

The largest category in terms of expenditure is schooling and education, to which 40% of total expenditure is allocated. Education and social assistance together with health care accounted for as much as 70% of budget expenditure of Piotrków Trybunalski in 2018. Transport accounted for 10% of total expenditure (Figure 1).

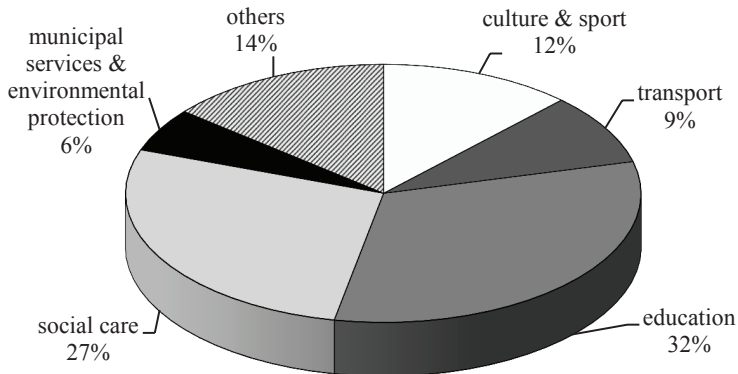


Fig. 1. Structure of budgetary expenditures of Piotrków Trybunalski in 2018

Source: [Report on the Performance... 2018].

The most significant category in the transport section of Piotrków Trybunalski's budget were roads, responsible for three-quarters of its total expenditure. Almost a quarter of expenditure in the discussed section was incurred for local public transport (Figure 2).

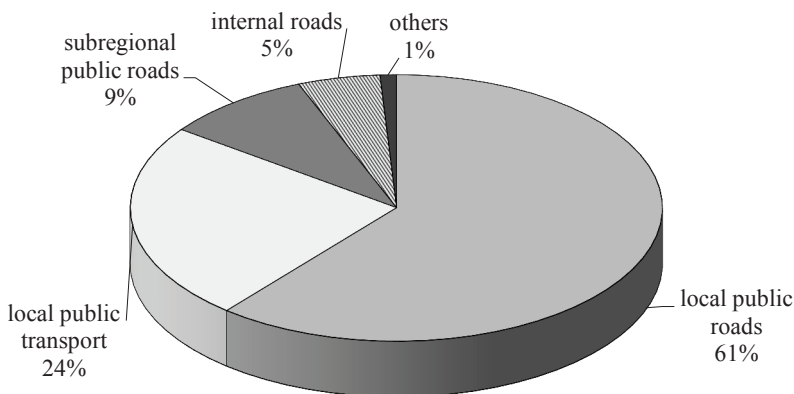


Fig. 2. Structure of budgetary expenditures on transport of Piotrków Trybunalski in 2018

Source: [Report on the Performance... 2018].

5. Case study: research on sustainable urban mobility in Piotrków Trybunalski

Piotrków Trybunalski is an important destination for residents of the surrounding municipalities. The size and spatial structure of the city creates favourable conditions for walking and cycling. In order to learn about the transport behaviour of the inhabitants of Piotrków Trybunalski, research was conducted in October 2019 on a sample of 458 respondents aged 15 years and more. Therefore, the survey covered 0.8% of the total population of the city aged over 15 years. The study was conducted using a telephone interview based on a questionnaire consisting of ten questions. The research was carried out for the purposes of developing a Sustainable Urban Mobility Plan for Piotrków Trybunalski at the request of Protrans Marcin Wołek in cooperation with Public Transport Consulting Marcin Gromadzki,

In which 48% of respondents were men, while 52% were women. The age structure of the respondents reflected the age structure of Piotrków Trybunalski residents in individual age intervals.

The study recorded journey distribution during the day before the survey was taken. The research included all the door-to-door journeys and took into account all pedestrian journeys. They were not limited due to time or distance (e.g. as in Gdynia in the study of residents' behaviour and preferences, where walking over 500 meters was considered as a walking journey, Comprehensive Traffic Research in Gdańsk

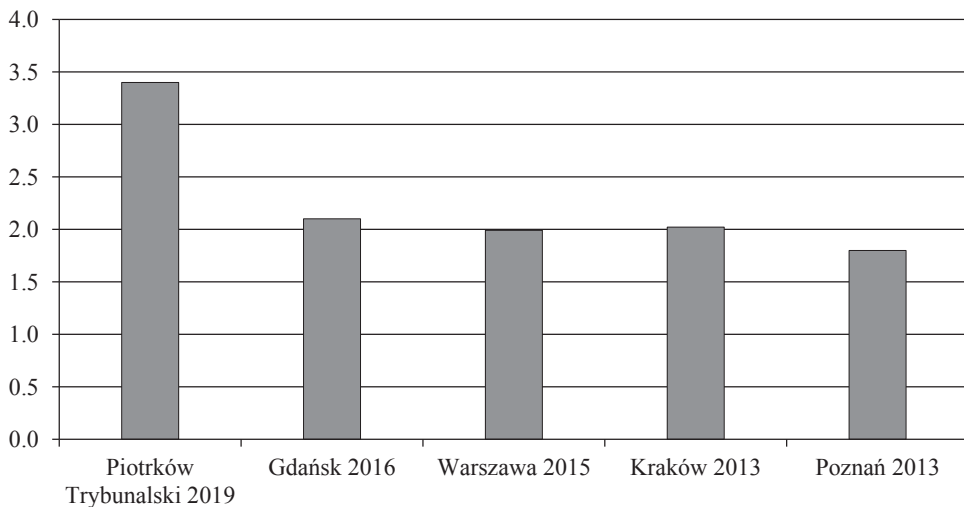


Fig. 3. Average daily mobility index in selected Polish cities

Source: own elaboration based on the results of marketing research (October 2019, $n = 458$), complex traffic research of Gdansk (2016), Warsaw (2015), Kraków (2013) and Poznań Metropolitan Area (2013).

and Krakow, where only pedestrian journeys over a distance of 250 meters were included). As a result of such a methodological approach, both the higher average number of journeys *per capita* – 3.4 (Figure 3), as well as a much higher share of pedestrian journeys in the modal split in Piotrków Trybunalski was observed, which reached 42% (Figure 4).

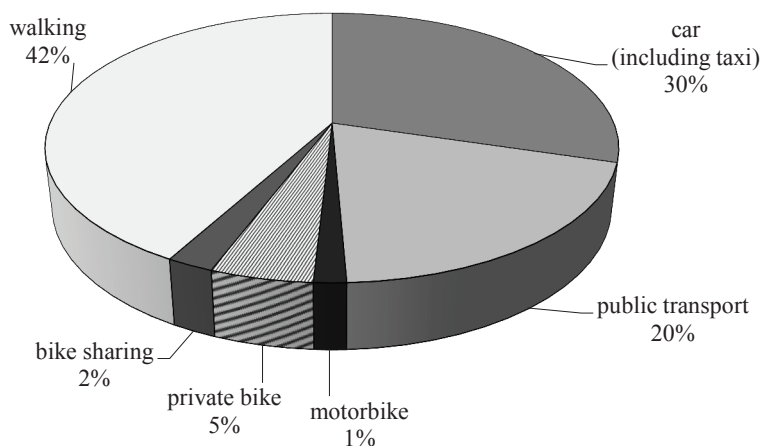


Fig. 4. Modal split (including pedestrians) of Piotrków Trybunalski (working day, October 2019)

Source: own elaboration based on the results of marketing research (October 2019, $n = 458$).

This result is also influenced by the size of the city and its spatial structure, which is conducive to short walking journeys. It should be noted, however, that depending on the research methodology used, the number of walking trips made over very short distances may be underestimated [Office for National Statistics 2019].

The share of journeys by bicycle is also relatively high – 7% (in total, including both private and bike-sharing). Almost one-third of the journeys were made by car, and only every 5th by public transport. Motorbikes had a negligible share in the modal split.

The division of journeys after excluding pedestrians is different. The dominant share of the passenger car is then noted, which accounts for more than half of all mechanized journeys. One-third of this type of journeys is carried out using public transport, and 12% by bike, which is an extremely significant result, taking into account the time of year in which the survey was carried out (autumn).

6. Quality of life and access to a car in households in Piotrków Trybunalski

Data on the mobility index, modal split and assessment of quality of life were obtained thanks to market research conducted among residents of Piotrków Trybunalski. The sample included 458 respondents over 15 years of age that were contacted via telephone in October 2019. The sample reflected the demographic features of the urban population (gender and age interval) The questionnaire was focused on mobility but part of it was related to issues of quality of life, where 56% of respondents declared that they have at least one car in their household. For the purpose of this paper, the segmentation of residents was conducted. Segmentation is a process that leads to the division of a given market into segments of consumers with different features (i.e. demographic, socio-economic, psychological) which require different marketing strategies [Kotler, Armstrong 2018]. The *post-hoc* segmentation process was performed, based on market data already collected [Liu et al. 2019].

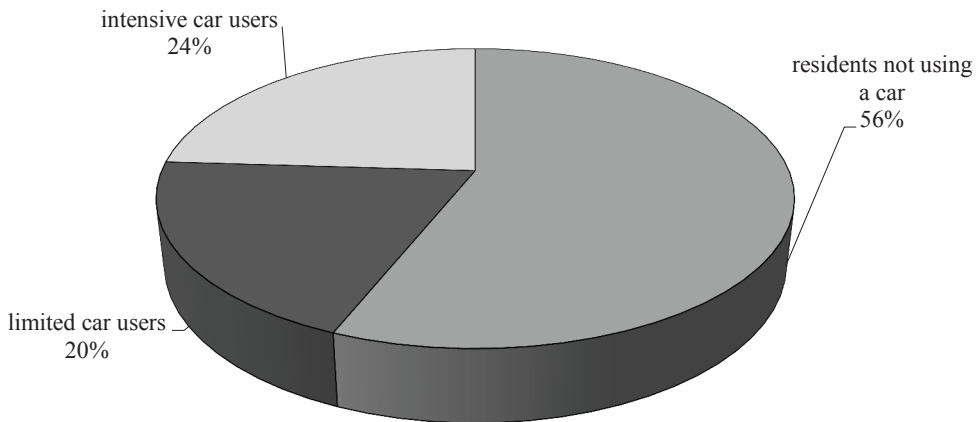


Fig. 5. Structure of particular segments of residents of Piotrków Trybunalski based on the research
Source: own elaboration based on the results of market research (October 2019, $n = 458$).

A major factor used in the segmentation was the intensity of car usage. Residents were divided into three groups, their main features are presented in Table 2. “Residents not using a car” consisted of 56% of the sample (Figure 5) and most of their daily journeys were made on foot (56%), followed by public transport (one-third) and bike (8%). This group of residents was characterized by the lowest number of journeys per day (3.19). Every fifth respondent was classified as a “limited car user” which means that the number of car journeys represented a maximum of half of all the journeys on a given day. Walking was the most popular way of mobility in that segment (43%), followed by car (40%) and bike (9%). This type of respondent presented the highest

number of journeys per day (3.86), which is 14% more than the average value for the whole sample (3.40). The share of journeys made by bike (private or shared) was almost the same in the segments previously described. The “intensive car users” segment made up nearly a quarter of the sample. The number of journeys was strongly dominated by car (83%) with a small share made up of walking (12%) and bike (3%), while those made by public transport were marginal (1%).

Table 2. Modal split of particular segments of residents of Piotrków Trybunalski

	Daily mobility index	Modal split					
		car	public transport	motorbike	private bike	bike sharing	walking
Residents not using a car	3.19	0%	34%	1%	5%	3%	55%
Limited car users	3.86	40%	5%	3%	7%	2%	43%
Intensive car users	3.50	83%	1%	1%	2%	1%	12%

Source: results of market research (October 2019, *n* = 458)

The next stage of the study included assessing the quality of life, according to five categories (from very low, through low, medium, high to very high). The largest share of high quality of life assessments in the city was among “intensive car users” (21%), however, this was equal to the share of the low and lowest ratings (Figure 6).

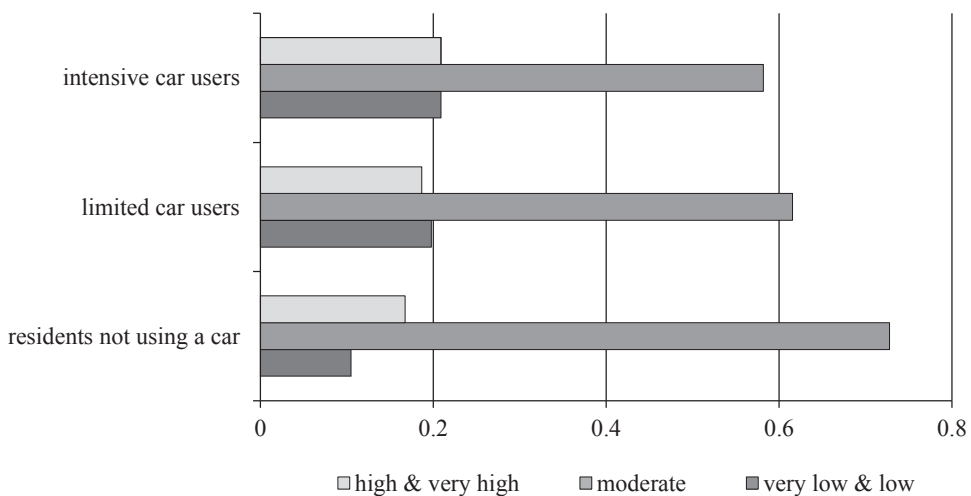


Fig. 6. Evaluation of the quality of life in Piotrków Trybunalski in particular segments based on the research

Source: results of market research (October 2019, *n* = 458).

The lowest share of high quality of life assessment in Piotrków Trybunalski was among respondents not using a passenger car, although ratings were substantially higher than the low ratings (17% to 11%). Moderate ratings were obviously the most popular among all three segments, but there were significant differences (58% in the case of “intensive car users”, through 62% among “limited car users” to 73% among citizens not using a car).

7. Conclusion

Quality of life is a subjective matter that is very difficult to measure in an objective way. To do so, a complex sets of indicators are being developed. They form different indexes and ratings at a national and local level, although the majority of local level ratings focuses on large cities and global cities, therefore the possibilities for comparison are limited. There is no single unified objective method for the assessment of the quality of life in a given city. Nevertheless, the quality of life is an important topic and international organizations stress the importance of an interdisciplinary approach to measure it.

Cities, due to their internal diversity and the frequent lack of comparable data, are an even greater challenge in comparing the quality of life. The need for strategic planning of mobility issues in urban areas results directly from its importance for the quality of life. Moreover, sustainable urban mobility plans integrate the above mentioned aspects [Wołek 2018] but there is a need to develop a proper research framework to evaluate quality of life in cities of different size and morphology. Urban mobility determines access to other ‘urban products’, therefore its importance goes far beyond transport-related issues. A model approach to sustainable mobility should therefore cover issues of broadly understood development, quality of life, and economic efficiency of the mobility system. The impact of mass motorization makes sustainable urban mobility planning an important policy of sustainable development at a local and metropolitan level. In such cases, sustainable mobility is not an end in itself, but should contribute to achieving higher goals, such as quality of life and the well-being of urban residents.

Based on the example of the research conducted in the Polish city of Piotrków Trybunalski, one can say that the assessment of quality of life is quite similar among residents with different access to car usage, although it has a tremendous impact on their modal split. A slightly higher assessment of the quality of life was noted among residents without access to a car during the working day.

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