WORking papers in Management Science

WORMS/20/13

Impact of urban transport innovation on the quality of life: what do passengers say?

[1]Magdalena Gądek, [2]Rafał Miśko

[1]Polish Saturday School, Coventry, United Kingdom
[2]Department of Organization and Management
Wrocław University of Science and Technology, Poland

WORMS is a joint initiative of the Management Science departments
of the Wrocław University of Science and Technology,
Wyb. Wyspiańskiego 27, 50-370 Wrocław, Poland

Impact of urban transport innovation on the quality of life: what do passengers say?[1]

Magdalena GADEK
Polish Saturday School, Coventry, United Kingdom, madzia.pawlowska@gmail.com

Rafał MISKO
Faculty of Computer Science and Management, Wroclaw University of Science and Technology, Wroclaw, Poland, rafal.misko@pwr.edu.pl

Abstract:

City authorities are taking action to increase public transport attractiveness. More and more innovative solutions are being introduced. Therefore, the research was aimed at answering the question: have innovations improved residents' quality of life in their opinion. The research was conducted in one of the Polish cities due to the number of introduced innovations. Surveys were carried out, which showed that the introduced innovations improve the quality of life of residents. In their opinion, innovations most influencing their quality of life are connected with security and travel comfort. Innovations connected with the environment and availability of information play also an important role.

Keywords: quality of life (QOL); public transport; innovations; management

Introduction

The literature indicates that the increase in the wealth of the Polish society affects the greater accessibility of individual transport to the users. Thus, the demand for public transport services is decreasing. Cities are becoming increasingly crowded with cars, which may lead to their transport paralysis. At the same time, the inhabitants bear the costs related to the negative impact on their health and natural environment (Barcik and Jakubiec, 2014), (Proost and Van Dender, 2012). The key to reversing this trend may be the introduction of innovative services and solutions that meet the needs of public transport passengers (Tsafarakis *et al.*, 2019), (Trippner-Hrabi and Podgórniak-Krzykacz, 2018). It should be emphasized that the improvement of the residents' quality of life may be the consequence of reversing the trend of increasing the share of individual transport in mobility within cities.

The issue of quality of life is widely discussed in the literature on the subject (Pukeliene and Starkauskiene, 2011). Some researchers express the opinion that no other topic is so frequently discussed (Shek, Chan and Lee, 2005). This concept is considered from the perspective of various sciences (Shek, Chan and Lee, 2005), e.g. medicine (Kane, 2003), ecology (Ims, 2018), or economic sciences (Vargas-Hernández, 2016). Moreover, specialised journals are dealing with the quality of life, such as "Quality of Life Research" or "Applied Research in Quality of Life". Due to the differences between scientific disciplines, it is not possible to develop a commonly accepted definition of quality of life. However, there is a consensus in the literature on the subject, with some reservations (Shek and Lee, 2007), that quality of life can be understood as “as the set of factors which contribute to the general well-being of people in terms of personal satisfaction with happiness, health, safety, intellectual and cultural preferences, financial security, family life, job satisfaction, etc. Quality of life has been defined as the level of satisfaction with an individual´s conditions, relationships, and surroundings relative to the available alternatives” (McGregor and Goldsmith, 1998), (Wallander, Schmitt and Koot, 2001).

[1] Accepted for 35th International Business Information Management Association (IBIMA) Conference.

Quality of life is also important from the perspective of sustainable development (Eusuf *et al.*, 2014). By integrating the natural environment into the socio-economic development of a region, country, or in the global perspective, the whole world, it is possible to improve its condition and thus the quality of life of people (Skowroński, 2006). The quality of human life cannot be considered in isolation from the quality of the natural environment in which humans live (Khasaev *et al.*, 2019).

Within the framework of European Union policy, the importance of improving quality of life and pursuing sustainable development can also be noticed. This is expressed, inter alia, through the European Mobility Week campaign. In fact, "since 2002 it has sought to improve public health and quality of life through promoting clean mobility and sustainable urban transport. The campaign gives people the chance to explore the role of city streets and to experiment with practical solutions to tackle urban challenges, such as air pollution"(*The campaign*, 2019). Moreover, at the strategic level, there are documents such as the Europe 2020 Strategy, which in its assumptions determines the need to support innovation, intelligent and sustainable development and counteracting social exclusion (*EUROPE 2020 A European strategy for smart, sustainable and inclusive growth*, 2010).

Schumpeter pointed out that innovation affects the quality of life. There are publications confirming the opinion of that author (Woodside, Bernal and Coduras, 2017). Therefore, it can be presumed that innovations related to sustainable urban transport can also improve the quality of life.

In the literature, studies are linking the quality of life to transport, e.g. on transport policy in ageing society (Metz, 2003), or generally on the impact of urban public transport on the quality of life of urban residents (Ciobanu, Bugheanu and Ciobanu, 2015), (Wann-Ming, 2019), (Ismail *et al.*, 2012). It is indicated that appropriate solutions in public transport, responding to the needs of residents, may contribute to the improvement of their quality of life (Przybyła, Kulczyk-Dynowska and Kachniarz, 2014). So, we should know the importance of innovation for residents (Tsafarakis *et al.*, 2019). At the same time, it should be emphasized that the comprehensive improvement of the quality of life only through the development of sustainable transport is insufficient (Wann-Ming, 2019).

In the authors' view, the impact of public transport innovation on the quality of life of passengers should be investigated, as it is an area that requires in-depth analysis. There are papers which try to rank innovation in public transport (Nalmpantis *et al.*, 2019), (Tsafarakis *et al.*, 2019), and are based on people's opinions. However, they are not investigating the quality of life and are not focused on passengers who are using those innovations on an everyday basis. This paper closes this research gap.

The results of the local government elections in Poland in 2018 proved that issues related to public transport are important for voters. They occupied the central positions in the programs of candidates for mayors. Those of them, including the former mayors, who cared about systematic and planned development of urban transport, usually either won in the first round or were elected in the second round (Gromadzki, 2018).

There are examples of cities in Poland where efforts have been undertaken to make public transport more attractive. For example, 198 electric buses were registered in Poland in July 2019. Most of them were registered in the following cities: Zielona Góra 43 buses, Warsaw 31 buses, Kraków 26 buses, Jaworzno 24 buses, Inowrocław 10 buses, Stalowa Wola 10 buses, Szczecinek 10 buses, Rzeszów 10 buses ("E-bus counter in Poland" 2019). Electromobility is, at present, a subject of particular interest among leading world economies (Altenburg, Bhasin and Fischer, 2012). Therefore, it is not surprising that also in Poland, steps are being taken to increase the share of electromobility in urban transport.

Zielona Góra may be considered the city with the highest number of introduced innovations in the context of urban transport and sustainable development.

The electronic boards informing about the actual departure time of buses were introduced in 2005. It was the first city in the country where this solution was applied. The interchange station was opened in 2019. The first electric buses appeared in Zielona Góra in 2018. From amongst the fleet of 100

vehicles in Zielona Góra, 43 buses are electric. They performed about half of the transport work in August 2019. 2018 was also the first year when free rides for students up to 20 years of age were introduced. Furthermore, the buses are equipped with video monitoring and some of them with defibrillators. Passengers can also use an interactive map indicating the position of the vehicles, the type of vehicle (electric) and the availability of a defibrillator on the bus. Additionally, it is possible to purchase tickets via mobile applications. The residents have also been provided with an option if an electronic ticket, the so-called e-card. All of the above changes are innovative solutions in the area of public transport in Zielona Góra.

The aim of the research was to identify, analyse and evaluate the impact of the introduced innovative public transport solutions on the passengers' quality of life. The research was conducted in Zielona Góra due to the diversity and number of introduced innovations.

Materials and Methods

Based on the analysis of the literature, the factors which theoretically influence the quality of life in the context of urban transport innovation were identified. The factors were also selected on the basis of the objectives to be achieved by the introduced innovations in urban transport in Zielona Góra. The analysis of the documents related to the introduced innovations showed that the undertaken actions were to reduce the noise level, to improve the air quality, to improve the safety and to facilitate the use of public transport. The list of factors was supplemented by the following elements related to the quality of life:

- safety (Pukeliene and Starkauskiene, 2011), (Cummins, 2000);
- material well-being (Pukeliene and Starkauskiene, 2011);
- accessibility of urban transport information for older adults (Hounsell et al., 2016);
- reduction of the negative impact of transport on the environment (Nosal and Starowicz, 2010);
- noise (Duarte and Tamez, 2009);
- comfort (Fellesson and Friman, 2012), (Putra and Sitanggang, 2016).

Due to the similarity criterion, it is possible to combine noise and reduction of the negative environmental impact of transport into one factor, which has been done.

As it was mentioned in the introduction section, there are nine types of innovation in the analysed city.

The survey was conducted among public transport passengers between 21.08 and 07.09.2019. The information about the survey was published on the website of the Municipal Department of Communication (MZK) in Zielona Góra and in the social media of the carrier. The respondents filled in an online form. The formulas in the questionnaire were consulted during trial tests. As a result, the decision was made to change the content of some of the questions in order to make them more understandable for the recipients.

The questionnaire consisted of 23 research questions covering factors influencing the quality of passengers' lives. A metric examining demographic data was also included. In the first part, the respondents were asked about the impact of introduced innovations on their quality of life. The 5-point Lickert scale was applied, where 1 meant a very negative impact on the quality of life, whereas 5 meant a very positive impact on the quality of life. For example, passengers were asked about the impact of electric buses on their quality of life. In the second part, the respondents were asked to link an appropriate statement relating to a given factor (eg. safety). For example, they were asked do the bus defibrillator affect their safety? The 5-point Lickert scale was also used here, where 1 meant that it did not improve at all, and 5 meant that it improved to a very large extent.

More than 400 people took part in the survey. If we take as our confidence level 95%, with unknown faction size (assuming 0.5) and a maximum error of 5%, knowing the population size - 60,000 users of public transport per day, then the minimum number of people in the study should be 382.

Therefore, it should be assumed that the research sample, with the given assumptions, is representative, and the results obtained on the sample can be extended to the whole population. It should also be emphasized that only questionnaires completed in full and correctly were accepted, those with gaps or errors were rejected. We gained 400 questionnaires and used IBM SPSS to all statistical analysis.

Since the questionnaire was the researchers' original concept, its reliability was analysed by calculating the coefficient alpha. The questionnaire consisted of two types of scales. Scale1 included questions concerning the impact of the applied innovations on the quality of life, Scale2 measured the change in the level of quality of life indicators after the introduction of innovative changes in urban transport.

Table 1. Cronbach's Alpha for Sale 1 and Scale 2.

Scale	Cronbach's Alpha	Number of items
Scale 1	.740	7
Scale 2	.740	7

Source: own work.

Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. The results presented in Table 1 indicate that an acceptable level of statistics of Cronbach's Alpha was obtained (reliability coefficient of .70 or higher is considered "acceptable" in most social science research situations), and therefore the questionnaire can be considered reliable.

The study involved 231 women and 169 men, whose age ranged from 18 to over 65 years, as shown in Table 2.

Table 2. Age of the respondents.

Age	Number of respondents
18-30	230
31-45	94
46-65	59
over 65	17

Source: own work.

The majority of respondents, 343 out of 400, indicated Zielona Góra as their place of residence. The level of education is presented in Table 3.

Table 3. Level of education of respondents.

Level of education	Number of respondents
Elementary	3
Lower secondary	26
Vocational	22
Secondary	171

Source: own work.

Results

Literature studies have indicated that there are factors linked to innovation in urban transport that can improve the quality of life of the users. The performed theoretical analysis resulted in the formulation of the main research hypothesis: H1: *There are statistically significant relationships between groups of innovative factors and measures of the quality of life of urban transport users*.

We have nine introduced innovations: 1. electric buses, 2. integrated interchange station, 3. surveillance system on city buses, 4. availability of a defibrillator during travel, 5. option to buy tickets through mobile applications, 6. free rides for students up to 20 years of age, 7. information about current GPS positions of buses via the website, 8. electronic bus stop boards, 9. introduction of an electronic ticket (e-card).

Aggregation of these innovations (factors) using factorial analysis with Varimax rotation was proposed. So there is need to check if conditions for factors analysis are fulfilled. Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's test of sphericity should be done.

Table 4. Kaiser-Mayer-Olkin's and Bartlett's tests.

KMO measurement of sample selection adequacy		.794
Bartlett's test for sphericity	Approximate chi-square	551.138
	Df	36
	Relevance	.000

Source: own work.

The Kaiser-Mayer-Olkin's test with high values (close to 1.0) indicates that factor analysis may be useful with provided data. If the value is less than 0.50, the results of the factor analysis probably won't be beneficial. Bartlett's tests with small values (less than 0.05) of the significance level indicate that factor analysis may be useful with provided data. Results in Table 4 show that conditions for factorial analysis are fulfilled.

Factor analysis is used to identify variables called factors that explain correlation patterns that occur within sets of observed variables. Factor analysis is often used in data reduction to identify a small number of factors explaining most of the variance observed in a large number of variables. Varimax method allows minimizing the number of variables with high factor loadings by orthogonal rotation. This simplifies the interpretation of the factors.

The applied factor analysis with Varimax rotation showed the existence of 2 new bundles of factors. The first bundle of factors include: the surveillance system introduced on the buses, availability of a defibrillator, introduction of electronic tickets (e-card), electronic bus stop boards and the possibility to buy tickets through mobile applications. The second bundle of factors is burdened with the following variables: the integrated interchange centre, electric buses, free rides for students, information about the current GPS position of buses via a website.

In conclusion, the conducted factor analysis with Varimax rotation resulted in the aggregation of nine factors into two factor beams. According to the method of main-factors components identification, the first one consists of 5 factors, and the second one consists of 4 factors. The statistical analysis and the results of Kolmogorov-Smirnov's test with Lilliefors correction for n=400 amounted to 0.161 and 0.111 for Component1 and Component2, respectively. The α value in both cases was lower than 0.05. That indicates that the distribution of new variables is not similar to the regular distribution.

In order to verify the primary research hypothesis H1: *There are statistically significant relationships between groups of innovative factors and measures of the quality of life of urban transport users*, four auxiliary hypotheses were formulated and then subjected to statistical tests. The first and second auxiliary hypotheses referred to the relationship between Component1 and the quality of life aspects studied: HpP1: *There is a relationship between Component1 and the improvement of the quality of life of the population*, HpP2: *There is a relationship between Component1 and the improvement of the quality of life in the four areas of the standard of living*. The results of the rho-Spearman correlation test for an alternative hypothesis to the studied hypothesis indicate that there are statistically significant monotonous relationships between all the variables studied. The values of correlation coefficients are shown in Table 5.

Table 5. Correlation test for Component1

	Value R	**Relevance at the level of 0.01**	**Interpretation**
Component1 Level of security improvement	0.613	0.000	Correlation high-dependence high
Component1 Level of environment improvement	0.371	0.000	Low correlation - clear dependence
Component1 Level of availability of information improvement	0.424	0.000	Moderate correlation - significant dependence
Component1 Level of travel comfort improvement	0.370	0.000	Low correlation - clear dependence
Component1 Level of quality of life improvement	0.558	0.000	Moderate correlation - significant dependence

Source: own work.

When interpreting the rho-Spearman ranks' correlation coefficients, it should be noted that the strongest correlation occurs between Component1 and the level of safety improvement. The relationship between Component1 and the general level of improvement in the quality of life of the inhabitants is considered to be significant. The second and third auxiliary hypotheses referred to the relationship between Component2 and the quality of life aspects studied: HpP3: *There is a relationship between Component2 and improving the quality of life of the population*, HpP4: *There is a relationship between Component2 and improving the quality of life in four areas of the living standard*. The results of the rho-Spearman correlation test for the alternative hypothesis with respect to the hypothesis under investigation indicate that there are statistically significant monotonic relationships among all the variables studied. The values of correlation coefficients are shown in Table 6.

Table 6. Correlation test for Component2

	Value R	**Relevance at the level of 0.01**	**Interpretation**
Component2 Level of security improvement	0.319	0.000	Low correlation - clear dependence
Component2 Level of environment improvement	0.501	0.000	Moderate correlation - significant dependence
Component2 Level of availability of information improvement	0.524	0.000	Moderate correlation - significant dependence
Component2 Level of travel comfort improvement	0.576	0.000	Moderate correlation - significant dependence
Component2 Level of quality of life improvement	0.670	0.000	Correlation high-dependence high

Source: own work.

When interpreting the rho-Spearman ranks' correlation coefficients, it should be noted that the strongest correlation occurs between the Component2 and the level of improvement in the quality of life in general. The relationship between Component2 and the level of safety improvement is considered to have a low degree of correlation. The link between the examined component and the other measures of improvement in the standard of living level is considered a significant relationship.

In the course of the survey, the respondents were asked to determine the degree of improvement in the quality of life in the following areas: the improvement of the security level, the improvement of the environmental conditions level (natural environment), the improvement of the availability of information level, the improvement of the travel comfort level. The appropriate measures were assigned to the above mentioned areas. The respondents were asked to assign an appropriate statement to a given measure in a particular area. Answers were marked on the 5-point Likert scale.

Table 7. Scale

Answer code	Meaning
1	Has not improved in any way
2	Has slightly improved
3	Has moderately improved
4	Has improved to a large extent
5	Has improved to a very large extent

Source: own work.

Surveys showed that the highest average value was achieved in the level of improvement in the travellers' safety. The average of the responses amounted to 4.45, which means that safety had improved significantly since the introduction of the innovations in public transport. The area of the improvement in a natural environment, at the time of the survey, was determined at the level of 3.14, which implies that respondents moderately feel the level of improvement in air quality or noise reduction. After the introduction of innovative solutions in the field of transport services, the level of accessibility to information improved significantly, which was estimated at the level of 4.27. The level of travel comfort, according to the respondents, improved on average at the level of 3.58. The analysis of the obtained answers indicates that in general the level of improvement in the quality of life of the inhabitants after the introduced changes was estimated to be 3.93, which means that the users of public transport experienced improvement in the quality of life level to a large extent.

Discussion

There are other studies that assess innovations in public transport. For example, (Tsafarakis et al., 2019) show that the most important innovation is “Real-time travel information at Public Transport stops”. In turn, (Nalmpantis et al., 2019) show that “enabling a seamless journey, using the best possible connections and the most suitable transport modes, provided through one interface, such as a platform that brings together different types of transport options and the provision of real-time transport information” has the highest score in terms of utility. In our research “availability of information” is also significant. Passengers in Zielona Gora are happy with electronic boards informing about the actual departure time of buses. In their opinion, it is one of the most important innovations.

There are other similarities too. One of the most important innovation is connected with tickets. People appreciate special prices for commuters (in our research: free rides for students) and advanced e-ticket system.

We have found additional innovations connected with the environment and with safety. Respondents say that the surveillance system and defibrillator have a positive impact on their quality of life. They think electric buses reduce noise and increase travel comfort.

It seems that other cities authorities when buying new buses should focus on buying electric ones with the surveillance system and provided with a defibrillator. That will increase the quality of life. In their mind should be advanced e-ticket system, with the possibility of mobile payments. Passengers will appreciate real time traffic information at bus stops too.

Further research should focus on conducting it on a larger sample, e.g. national or in comparison with other countries. This may be problematic as different cities have implemented different numbers of innovations in public transport. Other factors, i.e. those not examined by the authors of this article, may also be taken into account.

It should be noticed that the survey was based on the opinions of respondents. So there are some limitations. Hence, it is possible that respondents could give opinions without thinking more deeply about the questions. It is also essential that the respondents may not have had the same experience level as the introduced innovations. For example, some use them every day, others occasionally. The circumstances in which the subjects filled in the form were also significant.

Acknowledgments

The authors would like to thank Barbara Langner and Anna Chaberska for help in carrying out the research, and Ewelina Hajlasz for the guidance in the construction of the questionnaire. This research was funded by the Ministry of Science and Higher Education core funding for statutory R&D activities.

References

Altenburg, T., Bhasin, S. and Fischer, D. (2012) 'Sustainability-oriented innovation in the automobile industry: advancing electromobility in China, France, Germany and India', *Innovation and Development*, 2(1), pp. 67–85. doi: 10.1080/2157930X.2012.664036.

Barcik, R. and Jakubiec, M. (2014) 'The impact of innovative solutions in urban transport on the quality of life of residents (in polish)', *Logistyka*, (4), pp. 1637–1648.

Ciobanu, C.-I., Bugheanu, A.-M. and Ciobanu, R. C. (2015) 'The Influence of the Public Passenger Transport System on the Quality of Urban Life. Study Case: Bucharest', in *Management and Innovation For Competitive Advantage*. Bucharest, pp. 1087–1097.

Cummins, R. A. (2000) 'Objective and subjective quality of life: An interactive model', *Social Indicators Research*, 52(1), pp. 55–72. doi: 10.1023/A:1007027822521.

Duarte, C. M. and Tamez, C. G. (2009) 'Does noise have a stationary impact on residential values?', *Journal of European Real Estate Research*, 2(3), pp. 259–279. doi: 10.1108/17539260910999992.

E-bus counter in Poland (in polish) (2019) *Polski Fundusz Rozwoju*. Available at: http://www.infobus.pl/ebus (Accessed: 1 August 2019).

EUROPE 2020 A European strategy for smart, sustainable and inclusive growth (2010) *European Commision*. Available at: https://ec.europa.eu/eu2020/pdf/COMPLET EN BARROSO 007 - Europe 2020 - EN version.pdf (Accessed: 10 September 2019).

Eusuf, M. A. *et al.* (2014) 'Impact of Outdoor Environments on the Quality of Life', *Asian Journal of Environment-Behaviour Studies*. Elsevier B.V., 3(10), pp. 639–654. doi: 10.21834/aje-bs.v3i10.311.

Fellesson, M. and Friman, M. (2012) 'Perceived Satisfaction with Public Transport Service in Nine European Cities', *Journal of the Transportation Research Forum*, 47(3). doi: 10.5399/osu/jtrf.47.3.2126.

Gromadzki, M. (2018) *Comment: The election was won by those who develop public transport (in polish)*. Available at: https://www.transport-publiczny.pl/wiadomosci/komentarz-wybory-wygrali-ci-ktorzy-rozwijaja-komunikacje-miejska-60073.html (Accessed: 1 September 2019).

Hounsell, N. B. *et al.* (2016) 'Open Data and the Needs of Older People for Public Transport Information', *Transportation Research Procedia*. Elsevier B.V., 14, pp. 4334–4343. doi: 10.1016/j.trpro.2016.05.355.

Ims, K. J. (2018) 'Quality of life in a deep ecological perspective. The need for a transformation of the western mindset?', *Society and Economy*, 40(4), pp. 531–552. doi: 10.1556/204.2018.40.4.4.

Ismail, R. *et al.* (2012) 'Passengers Preference and Satisfaction of Public Transport in Malaysia', *Australian Journal of Basic and Applied Sciences*, 6(8), pp. 410–416.

Kane, R. A. (2003) 'Definition, Measurement, and Correlates of Quality of Life in Nursing Homes: Toward a Reasonable Practice, Research, and Policy Agenda', *The Gerontologist*, 43(Supplement 2), pp. 28–36. doi: 10.1093/geront/43.suppl_2.28.

Khasaev, G. R. *et al.* (2019) 'Ecology, innovation, and quality of life: AB OVO USQUE AD MALA', in Ashmarina S., V. M. (ed.) *Sustainable Growth and Development of Economic Systems*. Springer, Cham, pp. 121–134. doi: 10.1007/978-3-030-11754-2_9.

McGregor, S. L. and Goldsmith, E. (1998) 'Expanding Our Understanding of Quality of Life, Standard of Living, and Well-Being', *Journal of Family and Consumer Sciences*, 90(2).

Metz, D. (2003) 'Transport policy for an ageing population', *Transport Reviews*, 23(4), pp. 375–386. doi: 10.1080/0144164032000048573.

Nalmpantis, D. *et al.* (2019) 'Evaluation of innovative ideas for Public Transport proposed by citizens using Multi-Criteria Decision Analysis (MCDA)', *European Transport Research Review*. European Transport Research Review, 11(1). doi: 10.1186/s12544-019-0356-6.

Nosal, K. and Starowicz, W. (2010) 'Selected issues of mobility management (in polish)', *Transport Miejski i Regionalny*, 3, pp. 26–31.

Proost, S. and Van Dender, K. (2012) 'Energy and environment challenges in the transport sector', *Economics of Transportation*. Elsevier, 1(1–2), pp. 77–87. doi: 10.1016/j.ecotra.2012.11.001.

Przybyła, K., Kulczyk-Dynowska, A. and Kachniarz, M. (2014) 'Quality of Life in the Regional Capitals of Poland', *Journal of Economic Issues*, 48(1), pp. 181–196. doi: 10.2753/JEI0021-3624480109.

Pukeliene, V. and Starkauskiene, V. (2011) 'Quality of life: Factors determining its measurement complexity', *Engineering Economics*, 22(2), pp. 147–156. doi: 10.5755/j01.ee.22.2.311.

Putra, K. E. and Sitanggang, J. M. (2016) 'The Effect of Public Transport Services on Quality of Life in Medan City', *Procedia - Social and Behavioral Sciences*. Elsevier B.V., 234, pp. 383–389. doi: 10.1016/j.sbspro.2016.10.255.

Shek, D. T. L., Chan, Y. K. and Lee, P. S. N. (2005) 'Quality of life in the global context: A Chinese response', *Social Indicators Research*, 71(1), pp. 1–10. doi: 10.1007/s11205-004-8035-x.

Shek, D. T. L. and Lee, B. M. (2007) 'A Comprehensive Review of Quality of Life (QOL) Research in Hong Kong', *The Scientific World JOURNAL*, 7, pp. 1222–1229. doi: 10.1100/tsw.2007.217.

Skowroński, A. (2006) 'Sustainable development as the perspective of further civilisation development', *Problemy ekorozwoju*, 1(2), pp. 47–57.

The campaign (2019). Available at: http://www.mobilityweek.eu/the-campaign/ (Accessed: 1 September 2019).

Trippner-Hrabi, J. and Podgórniak-Krzykacz, A. (2018) 'Innovations in Local Public Transport – Significance for the Local Community', *European Spatial Research and Policy*, 25(2), pp. 117–135. doi: 10.18778/1231-1952.25.2.07.

Tsafarakis, S. *et al.* (2019) 'Investigating the preferences of individuals on public transport innovations using the Maximum Difference Scaling method', *European Transport Research Review*. European Transport Research Review, 11(1). doi: 10.1186/s12544-018-0340-6.

Vargas-Hernández, J. G. (2016) 'Women Entrepreneurship to Improve The Quality of Life Throught Best Practices in rural Microbusiness', *EMC Review - Časopis za ekonomiju - APEIRON*, 11(1), pp. 48–65. doi: 10.7251/EMC16048V.

Wallander, J. L., Schmitt, M. and Koot, H. M. (2001) 'Quality of life measurement in children and adolescents: Issues, instruments, and applications', *Journal of Clinical Psychology*, 57(4), pp. 571–585. doi: 10.1002/jclp.1029.

Wann-Ming, W. (2019) 'Constructing urban dynamic transportation planning strategies for improving quality of life and urban sustainability under emerging growth management principles', *Sustainable Cities and Society*, 44(October 2018), pp. 275–290. doi: 10.1016/j.scs.2018.10.015.

Woodside, A. G., Bernal, P. M. and Coduras, A. (2017) 'The Complexity Turn in Cultures' Consequences on Entrepreneurship, Innovation, and Quality-of-Life', in Woodside, A. G. (ed.) *The Complexity Turn: Cultural, Management, and Marketing Applications*. Cham: Springer International Publishing, pp. 133–183. doi: 10.1007/978-3-319-47028-3_5.