The Paradigm of Sustainable Transport and Mobility in Modern Transport Policy—A Case Study of the Mobility of the Creative Class in Poland

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Abstract This chapter is dedicated to the problems of sustainable urban mobility. Sustainable urban mobility is the basic instrument for improving the quality of urban natural environment by reducing the emission of air pollutants, noise and consumption of non-renewable natural resources by transport. In this paper, the authors present their observations concerning the paradigm of sustainable development in the formation of urban mobility based on the research on mobility preferences and behaviours of representatives of the creative class carried out at the University of Economics in Katowice. First of all, the paper presents issues related to the essence of the paradigm of sustainable urban mobility, particularly in terms of its inclusiveness. The existing literature on the relationships between the development level of urbanised areas and mobility was also reviewed. Furthermore, the legal acts of the European Union concerning the mobility policy framework were inventoried and characterised. The purpose of the article is to identify and analyse the transport behaviours and postulates of representatives of the so-called creative class in Poland. The paper presents the results of surveys conducted in three Polish metropolitan areas, in the total group of 450 creative sector workers.

Keywords Sustainable urban mobility · Public transport · Polish metropolitan areas

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1 Sustaining Urban Mobility as Instrument for Environment Protection

Not only does urban mobility determine individual freedom in the urban space, but it is mostly of key importance for the social and economic urban development. One of the paradigms of urban mobility is sustainable development, which is the foundation of modern transport policy. Sustainable mobility refers to effective management of non-renewable environmental resources—in cities, and particularly in metropolises, transport is one of the biggest sources of natural environment pollution, especially air pollution (smog) and noise. Sustaining urban mobility is an important instrument for efficient and effective natural environment protection, not only in cities, but also in their surroundings. We should also emphasize that this is not only related to nature, but mostly to human life environment. Apart from investigating the development factors, modern economic sciences search for the principles of effective and socially acceptable distribution of goods and services, both now and in the future. Due to the coincidence in time and research subject of the problems of sustainable and inclusive development, these problems are regarded collectively, or even as synonyms. The question is how to distribute the growth effects—now and in the future, as well as how to exploit non-renewable resources and rare goods, taking into consideration the future generations and their needs, which is the research subject of the prescriptive trend of environmental economy, which is referred to as green economy.

In this paper, the authors have presented their observations concerning the paradigm of sustainable development in the formation of urban mobility based on the research on mobility preferences and behaviours of representatives of the creative class carried out at the University of Economics in Katowice. Creative class, as defined by R. Florida, is a growing social group, responsible for progress and innovative development of cities, which are regarded as the centres of growth [1]. Not only does creative class lay foundations for this growth, but it also performs an important opinion-making function, and in particular, it creates the pattern of mobility behaviours. That was the basic premise for choosing this social group as the subject of our research interest. The empirical studies were carried out in three largest metropolises in Poland. In these agglomerations, similarly as in the whole country, there are currently dynamic changes related to building social capital, and the mobility preferences and behaviours are particularly changing.

The purpose of the research project whose results are presented in this paper was to examine the relationships between sustainability and inclusiveness of mobility, as well as to assess the impact of these processes on urban development. On the other hand, the empirical purpose was to assess the risk excluding the functioning of instruments for sustaining urban mobility used in transport policy. Verification of the correctness of research assumptions was based on the review of the literature on the subject (especially concerning the significance of sustainable mobility paradigm in transport policy) and on the study of initial mobility preferences and behaviours of the creative class in three largest agglomerations in Poland—the research was carried out by means of a survey questionnaire conducted by a professional research centre.

Moreover, the research was based on the experience gained during the implementation of scientific work, as well as on research and development work in the field of urban mobility.

The paper presents the analysis of the essence and basic tools for sustaining mobility in the cities. In particular, tools such as electromobility and personal transport were described. The significance of sustainable development in the European transport policy was presented. However, the most important problem is the assessment of conclusions drawn from the research on the mobility preferences and behaviours of the creative class.

The practical importance of mobility administration and management means that these issues are and will be developed in the application research. However, it should be noted that mobility, particularly in the environments that are in many aspects as complex as metropolises, are still a very little known research area in many scientific disciplines. Due to this fact, the undertaken research shall be regarded as a contribution to the development of a new scientific subdiscipline of great empirical significance, i.e. mobility economy. The transport system has a direct influence on the quality of life in the city. Transport must meet the growing expectations and adapt to the changing circumstances, including the increasing number of urban population, growth of individual car transport (especially in Poland), ageing society, change of economic structure (departure from heavy industry towards modern services), as well as increasingly high ecological requirements. The concept of planning transport by modelling mobility is connected with the creation of such a system of movement in the urban area that, on the one hand, will increase the availability of specific areas and services, being a significant stimulus for development, and on the other hand, will contribute to improving both the quality of life of inhabitants and the condition of the natural environment. Infrastructure and modes of transport are regarded as tools for facilitating movement rather than as an element creating mobility. The idea of planning mobility results e.g. from the fact that high economic and social costs of construction of transport infrastructure frequently prove to be ineffective. The expansion of road infrastructure in order to increase the capacity and reduce congestion often turn out to be a short-term solution.

2 The Essence of Sustainable Mobility Paradigm

2.1 Evolution of the Sustainable Mobility Concept

Sustainable development is defined in different ways, often broadly. Such is the case of the definition provided by J. R. and J. G. Engel, who, considering the problem of development in terms of ethics, perceive sustainable development as human activity maintaining and preserving the foundations of life on Earth [2]. Such an extended approach raises certain doubts, because the nature had been developing for billions of years, while at the same time the fate of entire species (not to mention their individual

representatives) was of little importance [3]. Taking into consideration the broad use and application of the concept of sustainable development not only in science and journalism, but also in legal norms (including at the constitutional level), a precise and unambiguous approach was advisable.

The discussion about sustainable development is a continuation of the reflections on corporate social responsibility. The importance of corporate social responsibility and sustainable development is based on the exposure of external effects and costs of business activity. In particular, external costs may lead to the exclusion of defined consumer groups from the distribution of goods and services.

The subject matter of corporate social responsibility was developed in the second half of the 20th century, although its origins could be traced back to the initial stage of capitalism development. The problems of business ethics and responsibility were the subject of "Rerum novarum" encyclical issued by Pope Leo XIII in 1891. From the perspective of the relationships between business and its surroundings, the key problem is to determine the non-economic role and goals of both the company and the entrepreneur. M. Friedman explicitly claims that the role of business is to maximise profits, whereas social issues are the responsibility of the state. Friedman formulated this opinion already in 1970, in the article with the explicit title "The Social Responsibility of Business is to Increase its Profits" published in The New York Times. According to Friedman, the entrepreneurs, and especially the managers calling for corporate social responsibility act contrary to the goals of the company, as well as against the company owners; what is more, by assigning funds to activities related to social responsibility, they may cause an increase of prices, and therefore, act to the detriment of customers. Nowadays, Friedman's views are in retreat. Were they not, however, based on a misunderstanding? Profit-making may and should be consistent with the respect for ethics, and Friedman does not question it. Moreover, the social activity of a company can be closely related to the economic goals. It may be intended to improve such profit factors as image building (which may impact not only an increase of the brand value, but also the so-called employer branding, which increases the effectiveness of employment), or improvement of efficiency (thanks to a greater employee identification with the company).

The development of the corporate social responsibility concept influenced the business practice and expansion of the circle of business activity stakeholders. These issues became an object of interest for the state, which was forced to address the questions about the costs of growth and the way the effects of the growth are to be consumed. That was the beginning of formulation of the sustainable development concept. The starting point was the problem of limitation and non-renewability of natural resources. The forecasted exhaustion of resources and environmental pollution forced government reactions and cooperation in the field of environmental protection and replacement of non-renewable resources with renewable resources. That was the beginning of the paradigm of sustainable development, i.e. such development that allows to increase the welfare, while at the same time reducing the consumption of non-renewable resources, especially including the natural environment. Sustainable development is regarded as the most socially effective (taking into consideration

the external costs), and in particular, it does not affect the needs of future generations. This last aspect makes sustainable development inclusive in inter-generational relations.

The notions of corporate business responsibility, sustainable and inclusive development address the problems of business ethics and civilisation development, as well as such fundamental issues as the right of individuals to consumption and freedom. These terms are not synonyms. While CSR means business (i.e. supply potential) which is ethical and takes into account the values which drive the society, the precise meaning of sustainable development is the protection of non-renewable resources (and more broadly speaking, the social effectiveness of production, after including the external costs). On the other hand, inclusiveness is nothing but fair distribution (satisfying the demand). An example could be the introduction of restrictions in access to the urban space for traditional cars, which means the exclusion of the owners of such cars, to the benefit of richer people who can afford to buy electric cars. Therefore, sustainable development, socially responsible and inclusive, should be regarded as a complementary concept of development, which takes into account both negative effects and external costs, as well as the importance of ethics in business and respect for all citizens.

In Poland, sustainable development is included in Art. 5 of the Polish Constitution ("The Republic of Poland shall safeguard the independence and integrity of its territory and ensure the freedoms and rights of persons and citizens, the security of the citizens, safeguard the national heritage and shall ensure the protection of the natural environment pursuant to the principles of sustainable development". [4]). Art. 5 of the Constitution indicates that sustainable development refers to activities which are connected with the environmental protection. The Environmental Protection Law of 27 April 2001 defines sustainable development as "socio-economic development which integrates political, economic and social actions, while preserving the natural equilibrium and the sustainability of basic natural processes, with the aim of guaranteeing the ability of individual communities or citizens both in the present and future generations, to satisfy their basic needs" [5]. Despite its expanded nature, this definition is also consistent with the framework defined by UN (Bruntland Report of 1987: "in essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations" [6]). It should be noted that both in Polish legislation and in Bruntland Report, the essence of sustainable development is economic growth as a factor that enables progress and fight against poverty. This view of sustainable development was also maintained in the documents approved at the UN Climate Change Conference in Rio de Janeiro in 1992 and in the initiatives that were launched following this breakthrough climate conference [7].

With reference to transport and mobility, the sustainable development concept resulted in models and tools for sustaining urban transport and mobility. Zero emission transport can be considered as sustainable, because it provides the possibility to fulfil mobility needs of future generations. However, the concept of zero emission should be regarded broadly: if it is electric transport, the energy should come from

renewable sources. Sail-driven water transport and bike transport (with the exception of power assisted bikes, unless the energy comes from renewable sources) can also be considered as zero emission transport. Zero footprint defined in this way is currently of marginal importance in fulfilling transport needs and mobility. The use of electric drives in the case of fossil-fuel or nuclear-generated energy only provides local zero footprint, although the environmental effectiveness of traditional and nuclear power plants is constantly growing. Sustainable mobility means such a model of transport behaviours (also referred to as mobility behaviours) where transport needs are fulfilled either by means of zero emission and low-carbon transport, or by walking.

2.2 Social Context of Mobility

Urbanisation as a global process leads to increasing the volume of transport needs, as well as to a higher structural complexity of such needs. In the case of large cities, and especially metropolises, transport systems are not capable of fulfilling the transport demand smoothly and effectively, especially during the peak hours. The spatial and infrastructural limitations cause congestion, whereas the widespread use of combustion cars is one of the reasons behind the formation of urban smog, which has a negative impact on human health. Scientific research shows the impact of smog on mortality and occurrence of various diseases. WHO attributes 26,000 deaths in Poland per year to the exposure to particulate pollutants (according to cautious estimates from 2012). The negative impact of pollution has been proven especially as regards its effect on the respiratory system (bronchial asthma—there are approximately 4 million asthmatics in Poland, chronic obstructive pulmonary disease (COPD)—approximately 2 million people, respiratory infections). Air pollution also increases the number of cancer diseases, especially the lung cancer. Moreover, research shows the negative influence of air pollution on cardiovascular diseases—including in particular thromboembolic complications, cardiac arrhythmias, ischemic heart disease and cardiac failure, atherosclerosis and heart strokes. A statistically significant relationship with air pollution has also been found in the occurrence of central nervous system diseases [8].

Managing mobility, and especially sustaining mobility, is the key area of modern urban policy. These issues have increasingly become an object of domestic and international policy, rather than only transport policy. The following can be mentioned among the derivative and related aspects of sustainable mobility policy: energy policy (including the problem of energy security), industrial policy and spatial development. The growing importance of urban mobility, which is becoming a bottleneck for development in metropolitan areas, is also evidenced by the increasingly intense discussion in traditional and social media, which concerns not only the attractiveness and originality of new mobility forms (e.g. as part of the so-called collaborative consumption, referred to as co-sharing economy), but also their connection with sustainable development (including effectiveness). Non-profit organizations, politicians, and increasingly often inhabitants participate in this discussion as well.

Sustainable mobility can be achieved by means of various tools. It is usually recommended to use such tools in a complex manner and adjust them to the local conditions [9]. However, searching for simplified solutions or shortcuts happens in some cases, with the use of instruments that have just become trendy and catchy for the media (frequently referred to as 'modern' in an evaluative manner), and then in transport policy practice, which, unfortunately, is also transferred to scientific discussions. The modern media communication is characterised by high simplification, dynamics and often exaggeration, intended to attract the readers' attention, which leads to attempts to expose a limited pallet of instruments as sufficient in order to achieve the expected results. In particular, this applies to the instruments that are not either restrictive or exclusive in nature. However, a closer analysis shows that a restriction usually takes place, but rather indirectly than directly (e.g. free urban transport causes a significant increase of demand, which may lead to restrictions in access to modes of transport, including for people with disabilities, who may find it more difficult to get into a crowded vehicle).

Historically, urban mobility was based on pedestrian traffic. With the growing urbanisation and increasing size of cities, new methods of fulfilling mobility needs appeared. Currently, increasing attention is paid to the necessity of priority treatment of pedestrian mobility [10] by eliminating car transport (especially combustion cars) to the benefit of pedestrian traffic in cities or selected zones in cities [11], or planning the spatial development of a city in such a manner that all needs could be fulfilled within the pedestrian traffic range [12]. In particular, this means establishing workplaces and residential areas in close proximity. And here the question of inclusiveness arises, which is connected with the value of land and real property in the cities. Both the areas intended for commercial activity and housing in cities are characterised by a relatively high value in comparison with non-urban areas, especially in the very city centres. When it comes to residential housing, it frequently takes the form of apartment buildings, whose price often reaches extreme values. For example, the price of 1 m^2 in an apartment building in downtown Warsaw exceeds EUR 5774 [13]. High prices are also characteristic for the locations near metro stations [14]. In relation to income, flats in agglomerations, including especially in Warsaw and Kraków, are characterised by the lowest accessibility (Table 1).

High housing purchase and rental prices in prestigious locations are acceptable for people with high income. The owners of such flats are managers and specialists employed in prestigious locations situated in the city centre. From this perspective, "city for pedestrians" becomes a "city for the rich". In the "city for pedestrians" concept, the employees, officers, students and pupils that are essential for the functioning of a city should reach their destination by public transport. This means closing the city, or at least its centre, to vehicle traffic. Similarly selected districts may also be closed to vehicle traffic and become pedestrian zones, connected with the city centre by means of metro or intercity rail stations.

Is the concept of a city for pedestrians seen in this way not an idea of a city with restricted availability, where the preferred mobility model takes into consideration mostly individuals with relatively high income? If so, then this is the concept of a non-inclusive city, even if it appears to be sustainable. In this way, it begins to

Table 1 Prices and relations between prices of flats and income (December 2018, EUR 1 = PLN 4.33)

	Warsaw	Kraków	Wrocław	Poznań
Average remuneration (EUR)[a]	1490.41	1307.16	1253.60	1352.13
Prices of flats on the primary market (EUR/m^2)[b]	1976.96	1597.03	1558.89	1582.63
Prices of flats on the secondary market (EUR/m^2)[b]	1888.08	1529.06	1422.40	1309.07
Number of m^2 of a flat on the primary market for average remuneration	0.75	0.82	0.8	0.85
Number of m^2 of a flat on the secondary market for average remuneration	0.79	0.85	0.88	1.03

[a]Average gross remuneration in the company sector in December 2018
[b]Transaction prices of flats according to the National Bank of Poland in the third quarter of 2018
Source [15]

resemble the ancient and medieval times, when living in a city was the privilege available only for higher and richer classes. At the same time, the city development was or was supposed to be orderly, as evidenced by the search for an ideal city where spatial development was subordinated to ideas and functionality [16].

Modern city is an available and attractive area. In European cities, suburbs originated as an area of voluntary exodus for the inhabitants of city centres and are not synonymous with poverty zones inhabited by precariat (unlike cities in the developing countries that frequently locate the poorer in destitute suburbs, i.e. slums, by introducing high material entry barriers). The origin of urban areas inhabited by precariat and poorer population is a combination of multiple factors (especially poor immigrant assimilation). Polish cities are characterised by the dispersion of poverty zones [17]. However, this situation will be changing—the increasingly intense development of city centres with office buildings and accompanying hotels, shopping centres and residential buildings will lead to an increase of the real property value in the centres of metropolises; therefore, residential buildings will be replaced by utility buildings and high-standard (and high-price) residential buildings. Therefore, the risk of mobility exclusion for people with lower income seems to be quite real.

A significant role in fulfilling mobility needs and sustaining mobility is played by public transport, which allowed for quick development of urbanisation thanks to its mass character. Public transport was the first mass urban transport handling system. It was not until the second half of the 20th century that its percentage was significantly reduced by the substitute individual car transport. The downward trends of the share of public transport in fulfilling transport needs are currently stagnating—especially in metropolises, where mobility cannot be effectively supported by a less efficient car transport system and where the share of public transport in fulfilling transport needs even begins to grow. The development of public transport and increase of its availability (in terms of space, time and costs) definitely influenced the reduction of mobility exclusion in modern cities. Car, with all its flaws, is characterised by even higher availability, which is why it began to replace public transport as the substitute. A special feature of public transport is the low specific greenhouse gas

emission (per passenger), particularly in the case of a metropolis with a large share of rail transport, which is based on electric propulsions. Moreover, it is worth noting that the current standard in traditional combustion engines in buses is to comply with very high exhaust emission standards (combustion vehicles increasingly often have Euro 6 standard, which means, in the case of diesel engines, not only a lower emission of carbon dioxide, but also of nitrogen oxides). Therefore, especially in large cities and metropolises, public transport should be considered as the basic mobility management tool.

2.3 Electromobility in Fulfilling Transport Needs in Cities

Sustaining urban mobility is based on a broad use of public transport, as well as bike and pedestrian traffic. These issues have already been discussed in detail earlier. The above-mentioned instruments can be referred to as classic or traditional. Currently, the following instruments (referred to as modern) are considered to be particularly promising from the perspective of sustainable mobility:

- electromobility,
- sharing modes of transport,
- personal transport (scooters, boards, roller skates).

Urban electromobility concerns both traditional transport subsystems in the city (individual car transport, two-wheel transport and public transport), as well as new transport subsystems, such as personal transport and systems of shared car transport (car sharing), as well as two-wheel transport (bike sharing and shared scooters). Therefore, the following transport systems in which electromobility appears can be distinguished:

- public transport using electric vehicles,
- individual electric cars,
- private electric bikes and scooters,
- electric car sharing,
- electric bike sharing and shared electric scooters,
- electric means of personal transport (scooters, boards).

Treating electromobility as the foundation of the current and future mobility model is rooted in the policy of decarbonising transport and logistics. However, it has been emphasized in the literature on the subject that it currently does not have to be the most effective instrument of decarbonisation (taking into account the external costs) [18]. The so-called green technologies also generate external costs, which are difficult to estimate precisely e.g. as a result of non-market calculation methods [19]. However, the development of technology for obtaining electricity from renewable sources (particularly solar energy) allows to predict the long-term and significant reduction of own costs related to electromobility, which will not only change the own costs of electric cars, but especially the balance of external costs.

The competitive position of electromobility also depends on the development of traditional propulsions. Combustion engines are characterised by the reserves of efficiency improvement and their environmental effectiveness grows on a regular basis. It should also be remembered that electromobility either reduces to a low extent, or does not reduce at all certain external costs—namely congestion, land consumption and costs of accidents. The cost competitiveness of electric propulsions in road transport is mainly influenced by the following factors (apart from the own costs and external costs of electricity):

- significantly higher price of electric buses,
- investment expenditure on the development of charging technology and necessity of expensive replacement of batteries,
- lower efficiency caused by the necessity to charge batteries.

Electric buses locally allow to obtain significant ecological effects. However, the inclusion of all conditions in the balance shows that the global (domestic) effect of replacing buses with traditional propulsions by electric buses can be unfavourable. This has been observed in the comparative analysis of the replacement of the rolling stock operated in Sopot. In the perspective of 25 years, even when taking into account the reduction of external costs (additionally based on assumptions which are not verified by the market)—electromobility is only beneficial at a local scale, whereas on the national level, the "diesel" variant assuming the replacement of rolling stock is over 14% more favourable [20]. On the national level, due to the structure of electricity production, the electromobility options considered are less beneficial not only comprehensively, but also in terms of external effects.

Electric cars are also apparently considered as an exceptionally effective tool for sustaining urban mobility. However, it shall be noted that electric car:

- does not eliminate congestion,
- does not improve safety in road traffic (and if so, this is thanks to the application of telematic solutions, which are also installed in combustion vehicles),
- has a smaller range (requires charging), which may not be an obstacle in the city, but may create barriers reducing the availability in case of suburban journeys,
- is twice more expensive than gasoline vehicles, which is reflected e.g. in the sales of such cars—only 637 electric cars were registered in Poland in 2018 [21] (the target 1 million electric cars by 2025 assumed by the government seems to be completely unreal).

Many countries use preferences for the buyers and holders of electric cars. In Norway, an electric car buyer is exempt from 25% VAT, and moreover, pays 50% of road tolls and is exempt from the road tax, which has been criticised—the Danish climate minister noted that this is the most expensive instrument of climate policy, which can only be applied thanks to Norway's revenue from the extraction of oil [22]. In Poland, there are also subsidies for the buyers of electric cars [23] and preferences related to access to city centres (exemptions from parking fees). This means access preferences for those who can afford to buy an expensive car (despite the announced discounts, such vehicle will be significantly more expensive than a new combustion

vehicle—not to mention a second-hand car—and its availability will be limited to people with a higher than average income [24]). Access preferences in the city for such vehicles mean that the availability of urban space for the owners of cheaper vehicles is reduced.

2.4 The Role of Bike in Shaping Mobility

Bike is regarded as an important element of sustainable urban transport and sustainable mobility model. This is not only because of zero footprint, but also due to its positive impact on health [25]. The European Cyclists' Federation estimates the annual "bike" benefits of UE-28 (taking into account the external costs) at the level of more than EUR 513 billion [26], out of which approximately EUR 191 billion is the effect of positive impact of bike mobility on health. For this reason, bike, together with pedestrian mobility and movement by means of boards, scooters, wheelchairs and ski desks, are considered to be elements of the so-called active mobility or active transport—this term refers to human-powered modes of transport, whereas electrically powered modes of transport (e.g. scooters) are regarded as examples of hybrid transport [27]. Active mobility and hybrid mobility inevitably bring significant health lifestyle changing benefits, and consequently become a factor in building social capital of modern metropolises. The advantages of active mobility must be regarded precisely in this context and cannot be perceived as a full alternative to cars—such an alternative, particularly in the Polish spatial, climatic and cultural conditions, is offered by public transport. Bike as a mode of transport also means healthy lifestyle, tailored to the so-called development trends of leisure industries. The development of bike infrastructure, bike sharing system, as well as common interest in bikes and healthy lifestyle are particularly important for the society [28] (Fig. 1).

The share of bikes in fulfilling mobility has increased in many cities. These are mainly private bikes, however, the importance of public bikes available in the form of collaborative consumption (bike sharing) grows relatively dynamically, especially in the area of large cities. The share of bikes in fulfilling transport needs in European cities is not higher than between a few and several per cent (with the exception of Scandinavian and Dutch cities—Table 2). It seems that spatial factors are a sort of "glass ceiling" for the increase of this ratio, i.e. travel distance and time, which are usually stated as the causes of withdrawal from the use of car in urban travel, apart from the climate issues [29]). Therefore, bikes, especially in the bike sharing formula, should be regarded as the so-called "last mile" mode of transport—bikes should increase the availability of public transport (mainly including rail transport). Therefore, smooth operation of this type of bike transfer systems by the operators between parking stations is required, so as to ensure the availability of bikes.

Bike should be treated as a complementary system to public transport—however, research concerning the effect of introducing free fare public transport [31] shows that these two systems are substitutional [32]. What is more, it turns out that bike as a way to fulfil mobility needs is selected, to a large extent, for income-related

Table 2 Share of bike in fulfilling mobility in cities

EU capitals	Share of bike (%)	Research year
Copenhagen	35	2010
Amsterdam	32	2012
Berlin	13	2008
Ljubljana	12	2013
Helsinki	11	2013
Zagreb	10.1	2012
Stockholm	9	2013
Dublin	7.9	2013
Vienna	6	2013
Riga	4	2014
Brussels	3.5	2013
Luxembourg	3.5	2011
Sofia	3	2010
Nicosia	2	2010
Paris	2 (2nd source: 5%)	2013
Athens	2	2005
Budapest	2	2014
Bratislava	2	2012
London	2	2009
Prague	1	2013
Tallinn	1	2012
Vilnius	1	2010
Warsaw	1	2009
Lisbon	1	2013
Bucharest	1	2007
Rome	0.6	2012

Source [30]

reasons—in the Netherlands, as much as 30% of journeys made by 10% inhabitants with the lowest income are bike journeys (in the case of 10% of inhabitants with the highest income—it is as much as 20% of journeys) [33]. Seeking complementarity of bikes to public transport is a challenge not only for the bike sharing systems, but also for private bikes used in fulfilling mobility. The integration of transport in cities, including the creation of parking stations and bike stations, is a direction for reducing the substitutability of bikes in favour of their complementarity.

In the recent years, the so-called personal modes of transport—such as scooters and boards, often with electric propulsions, previously used for recreational purposes, have been in widespread use. The increasing interest in scooters is related to the development of collaborative consumption (sharing economy) [34]. In Poland, the

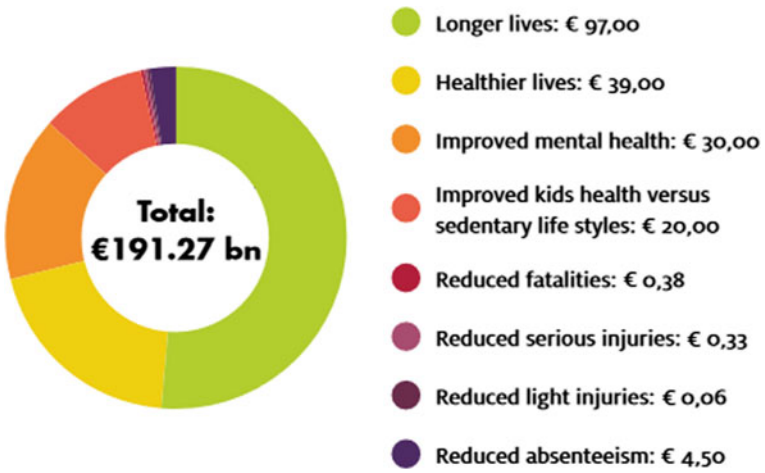

Fig. 1 Annual benefits of using bikes in terms of health improvement—estimates in EUR billion for EU 28 (data as of 2016). *Source* [25]

first scooters were offered for rental by the global start-up Lime in Wrocław (in the free floating model—i.e. the scooter can be left in any place) [35]. According to the estimates of "Rzeczpospolita", there are 3000 electric scooters for rental in 3 cities in Poland, and this number will increase to at least 12,000 over the next few months [36]. The market of shared vehicles (including also bikes, scooters and cars) is assessed to be strongly growing—the number of vehicles forecasted for 2019 is almost 37,000—although in terms of the number and income, the unquestionable leader is the bike (PLN 92.9 million, followed by cars at the level of PLN 57.2 million, scooters—PLN 15.7 million and scooters with approximately PLN 33.6 million) [37]. It should be emphasized here that the leader in the Polish bike sharing market obtains approximately 90% of income from urban subsidies and advertising. The adopted business model may turn out to be inefficient in the case of extending activity—this is what happened in the Tricity agglomeration (Gdańsk-Gdynia-Sopot), where the agreement with the system operator was terminated after 7 months of the operation of the metropolitan e-bike sharing system with over 1200 bikes (the main causes were attributed to the problems with bike dislocation and delays in the system extension) [38].

The enthusiasm related to the role of means of personal transport in sustaining mobility is discouraged by the following issues:

- the devices require electric power supply, which raises valid objections regarding the domestic effectiveness of their application in the case of energy mix based on non-renewable resources (similarly as in the above-quoted example of the planned investment in Sopot),
- the applicable legal regulations regard people moving by means of such vehicles as pedestrians, which does not allow them to use the roads for cars and bikes, and moreover, due to the fact that such devices can reach the speed of up to 40 km/h,

they constitute a significant threat for pedestrians (this also applies to electric bikes, in which an increase of speed may lead to more serious accidents [39]).

Personal means of urban transport, mainly offered in the collaborative consumption model, are regarded (especially by media) as an instrument that may quickly change the urban mobility model. There is no evidence proving such statements or data about the actual role of scooters in fulfilling mobility needs. It is also worth noting that this mode of transport poses risks for the pedestrian and bike movement (Fig. 2). Currently, high hopes for a change of mobility behaviours are placed on personal transport. The practice does not allow to form optimistic opinions. The operators have no control over the users' behaviours, which poses a serious hazard for pedestrians and cyclists. It is difficult to draw firm conclusions without research, but the hypothesis saying that personal modes of transport are substitutes of pedestrian movement, thus having no impact on sustaining transport and mobility in cities, seems to be probable.

Fig. 2 Examples of abandoned scooters rented in sharing-economy system (Siemianowice and Katowice, 2019)

3 Mobility in Transport Policy

3.1 Impact of the Development of Urbanised Areas on Mobility

Urbanisation understood as a social and cultural process expressed by the development of cities, increase of their number, growth of urban areas and share of urban population in the entire population (or share of population living in line with the urban patterns) [40] is one of the most characteristic global phenomena of the 20th and beginning of the 21st century [41]. Modern urbanised areas are most frequently multi-million cities, agglomerations and metropolises, characterised by a large concentration of population, as well as social and economic activity. The development of cities has a long history in which various factors have played a significant role, including such e.g.: geographical (convenient location), economic (industrial and service activity), political (centres of power), religious (places of religious cult), as well as social and cultural factors.

The modern philosophy behind the shaping of urban space was reflected in the New Athens Charter of 2003, also referred to as "the vision of cities of the 21st century" [42]:

1. The connected city: connecting through time—historical continuity.
2. Social connectivity—social balance, involvement, multi-cultural richness, connections between generations, social identity.
3. Economic connectivity—globalisation and regionalisation, competitive advantages, city networking, economic diversity.
4. Environmental connectivity—environmental balance, healthy city, nature, landscape, and open spaces.
5. Spatial synthesis—spatial linkages, connecting through character, continuity and quality of life.

Cities differ from one another in terms of the problems and expectations of their inhabitants. They also have different development conditions and opportunities due to the performed functions. Apart from the historically developed and constantly developing cities, there are also the so-called cities built "from the scratch", which are assumed to be modern cities of the future, ensuring an adequately high quality of life for their inhabitants. They are increasingly often referred to as "smart cities".

The concept of smart city as a modern city of the future assumes sustainable development of cities based on innovative technologies, which are applied in order to improve the functionality of cities in terms of management in a cost efficient, effective and ecological manner. Smart cities are defined in very different ways. There are frequently 6 basic components indicated as the elements of a smart city: smart governance, smart economy, smart mobility, smart environment, smart people and smart living [43]. Smart mobility as one of the elements of the smart city concept is vital in the functioning and development of the city, as well as the quality of life of

inhabitants [44]. There are also development stages of smart cities (Smart City 1.0, 2.0, 3.0) [45].

It is generally considered that city can be regarded as "smart" when it undertakes investment in the human and social capital, as well as transport infrastructure for the purpose of active promotion of sustainable economic growth and high quality of life, including clever natural resource management, through participation of its citizens.

An interesting concept of the city according to Nijkamp [46] was presented by Lidia Mierzejewska [47] in her publication entitled *W poszukiwaniu nowych modeli rozwoju miasta*. The author writes that according to Nijkamp P., cities can be ranked from the smallest (XXS) to the largest (XXL), modelled on clothes in shops, adopting the quality of life of inhabitants as the criterion. According to this concept, dynamically developing, competitive and innovative contemporary cities can be defined as Self-Organising Innovative Complex Systems that should be characterised by [47]:

- dependence on creativity, innovation and management,
- high level of progress in the research and development area,
- productivity and competitiveness, which are decisive for the economic success,
- market orientation,
- development path defined by the evolutionary complexity and behavioural learning rules.

Following Nijkamp P., the author states that there are five basic factors that have an impact on the development of such cities and metropolitan areas (XXQ SIC), namely [47]:

1. economic capital—referring to the economic fundamentals that are necessary for the effective operation of the sustainable city area,
2. ecological resources—mainly concerning the environmental base, conditioning the sustainable development of the city,
3. technological systems,
4. geographical infrastructure,
5. social superstructure—represented by the social forces creating a sustainable society.

The quality of life (QoL) is an object of interest for many researchers in various scientific disciplines. It is a concept that inspired multiple studies over the last few decades and established its firm position in local, domestic and international programmes [48]. The assessment of the quality of life in cities (QoL) is currently a problem of growing importance, not only in the academic literature [49]. The issues that are objects of interest for the researchers also include air pollution, congestion and transport. The objective measurements or social indicators broadly represent the standard of individual living, covering verifiable conditions proper for a specific cultural unit [50].

Modern urbanisation is a highly complex and multi-aspect process, considered at several levels, e.g. in the demographic, social, economic, spatial, ecological and legal aspects [51]. The demographic aspect is the total urban population growth and increase of the urban population percentage, the economic aspect is the increase

of the number and percentage of employees hired in sectors other than agriculture, the spatial aspect is the construction expansion and development of urbanised areas, whereas the social aspect is the popularisation of the urban lifestyle. The subject and stages of urbanisation are described in more detail by Daniela Szymańska and Jadwiga Biegańska in their publication entitled *Fenomen urbanizacji i procesy z nim związane* (The phenomenon of urbanization and related processes) [51].

Modern urbanisation processes, frequently referred to as metropolisation, have led to the occurrence of new spatial forms with an increasing urban-planning complexity [52]. An urban complex that is particularly huge in terms of population and space is referred to as a megalopolis, understood as a large urbanised area, formed as a result of territorial expansion of metropolitan areas that are geographically close [53].

As a result of the fast urbanisation process, in 2007 the global population became more urban than rural for the first time in history. It is expected that this process will be continued during the upcoming decades, and an increasing number of populations will be living in urban areas. Figure 3 presents the forecasted global urban population including more and less developed regions in 1950–2050.

Although it is expected that the global population will continue to urbanise, the urbanisation rate is predicted to slow down in the future. Due to this, it is expected that in 2018–2030 the global urban population will be increasing by 1.7% per year on the average, which is significantly less than in 1950–1970 (3.0%), 1970–1990 (2.6%), or in 1990–2018 (2.2%). It is also expected that the percentage of urban population will be growing at a slower rate: 0.7% in 2018–2030 and 0.6% in 2030–2050. Until

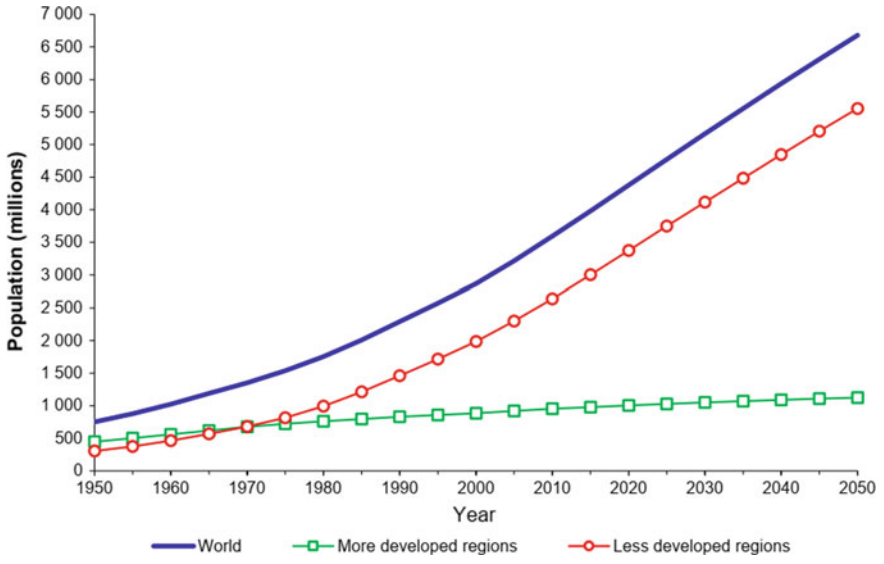

Fig. 3 Forecasted global urban population including more and less developed regions in 1950–2050. *Source* [54]

2050, it is expected that 68% of global population will be living in cities, whereas the number of inhabitants in cities will amount to 6.7 billion (Fig. 4).

Figure 5 presents forecasted global urban population including more and less developed regions in 1950–2050. Figure 6 presents global urban population including more and less developed regions in 1950–2050.

The data included in Fig. 5 show that the advantage of population in less developed areas will increase in comparison with the more developed areas. On the other hand, Fig. 6 indicates a clear disproportion between the urban population in more and less developed areas, as well as a significant forecasted increase of the urban population in less developed areas.

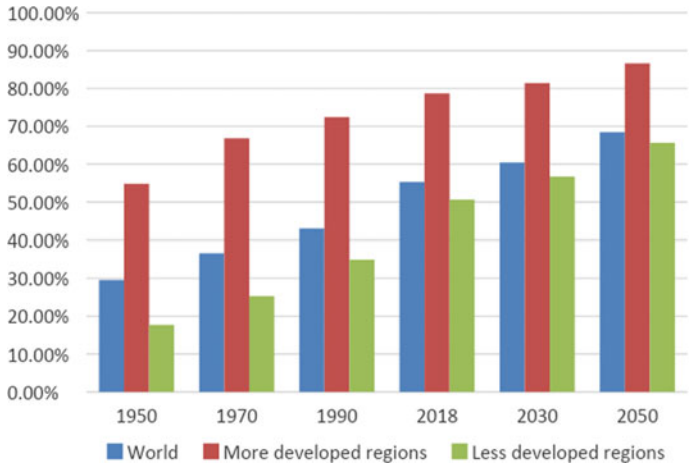

Fig. 4 Global urban population including more and less developed regions in 1950–2050. *Source* [54]

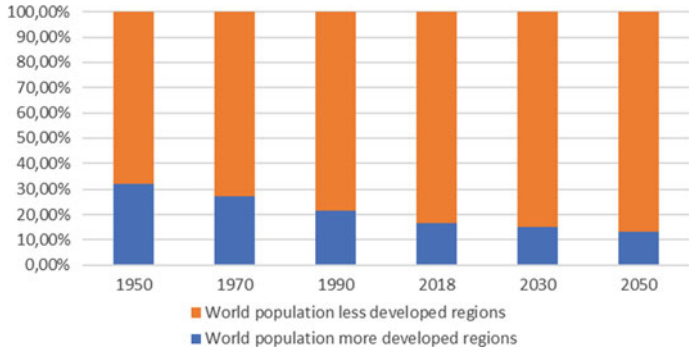

Fig. 5 Total global population including more and less developed regions in 1950–2050. *Source* [54]

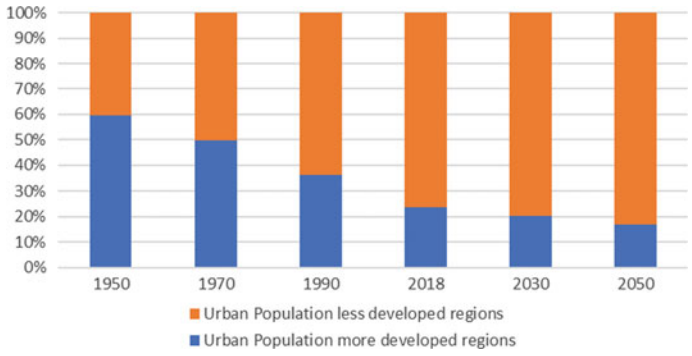

Fig. 6 Global urban population including more and less developed regions in 1950–2050. *Source* [54]

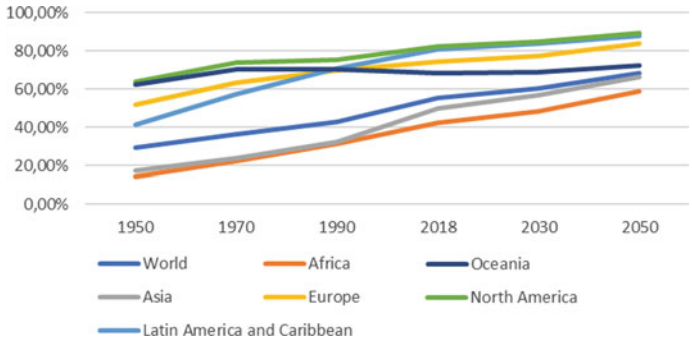

Fig. 7 Percentage share of global urban population by geographical regions in 1950–2020. *Source* [54]

Figure 7 presents the percentage share of global urban population by geographical regions in 1950–2020. As can be seen in Fig. 7, the increase of the number of population in urbanised areas is a general global trend. The highest urbanisation levels are achieved in highly developed countries. Until 2050, it is forecasted that the highest increase of urban population will take place in Africa and Asia.

Figure 8 presents the forecasted distribution of global urban population in 2050.

Urbanised areas do not develop at the same rate around the world. The fastest population growth is in the biggest cities—megacities with 10 million inhabitants or more. In 1970, 55 million people lived in megacities, whereas the biggest number of people lived in the cities with the population below 300,000 (730 million people). In 2018, the number of inhabitants in megacities increased ninefold to 529 million people, whereas in the cities with the population below 300,000, the number of people increased only 2.5 times, to 1.75 billion. Table 3 contains data concerning the number of inhabitants of cities divided into cities of various size in 1970–2030, as well as the percentage share of particular types of cities within urbanised areas.

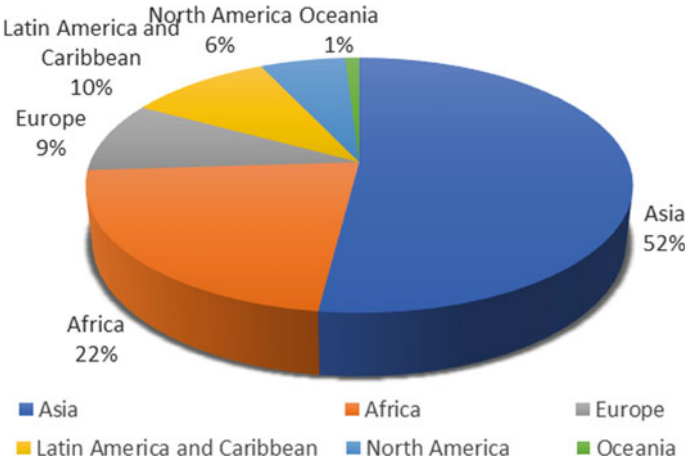

Fig. 8 Forecasted distribution of global urban population in 2050. *Source* Own study based on [54]

Table 3 Number of city inhabitants by city size in 1970, 1990, 2018 and 2030

City size (number of inhabitants)	Population (millions)				Percentage			
	1970	1990	2018	2030	1970	1990	2018	2030
Urbanised areas	1.354	2.290	4.220	5.267	36.6	43.0	55.3	60.4
10 million and more	55	153	529	752	1.5	2.9	6.9	8.8
5–10 million	107	156	325	448	2.9	2.9	4.3	5.2
1–5 million	244	467	926	1.183	6.6	8.8	12.1	13.8
500,000–1 million	131	208	415	494	3.5	3.9	5.4	5.8
300,000–500,000	87	159	275	320	2.3	3.0	3.6	3.7
Fewer than 300,000	730	1.147	1.750	1.971	19.7	21.5	22.9	23.1

Source [54]

It is forecasted that the number of inhabitants of megacities in 2030 will have increased to 752 million and will constitute 8.8% of the global population. Similarly, an increase of population is expected in cities of all other sizes. Currently, a majority of city inhabitants around the world live in cities with the population below 1 million. In 2018, two billion people lived in cities with less than 500,000 inhabitants and further 400 million people lived in cities with the population of 500,000–1 million inhabitants. It is forecasted that in 2030 still over half of the city inhabitants in the world (2.8 billion) will be living in cities with the population below 1 million. Compared to bigger cities, the cities with less than 1 million inhabitants are the most common type of cities in the world. It is predicted that the number of people living in cities of 500,000–1 million will increase from 415 million in 2018 to 494 million in 2030, which will constitute approximately 10% of the global urban population. One in five city inhabitants around the world lives in a medium-sized of 1–5 million

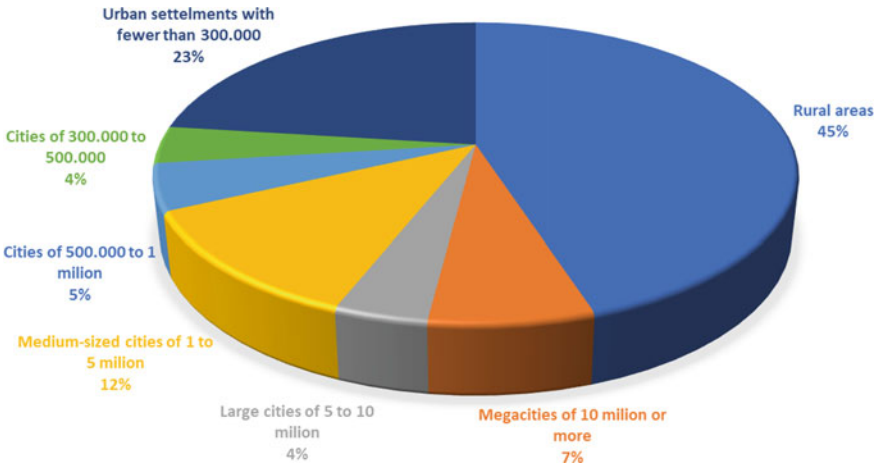

Fig. 9 Global population by residential area and size of urban settlement in 2018. *Source* [54]

inhabitants. Such cities, regarded as medium-sized in line with the global standards, are in fact the biggest cities in 85 countries or regions. While a majority of capitals in the world are smaller, almost 40% of capitals are medium-sized cities [54].

Figure 9 presents the breakdown of global population in 2018 by the residential area (rural or urban) and city size.

Megacities, due to their size and concentration of business activity, are a huge challenge. In 1990, there were 10 cities with more than 10 million inhabitants. Currently, this number has grown threefold to 33, and the majority of megacities are located in Asia (Tokyo, Jakarta, Seoul, Delhi, Shanghai, Manila, Karachi, Mumbai, Beijing, Dhaka, Osaka, Kolkata, Tianjin, Shenzhen, Guangzhou, Bangkok, etc.). 13% of city inhabitants in the world presently live in megacities.

Figure 10 presents the population and number of cities in the world by city size in 1990, 2018 and 2030.

It is forecasted that the number of megacities in 2030 will have increased by another 10, from 33 to 43 megacities. The number of large cities with the population of 5–10 million is expected to increase from 48 to 66, the number of medium-sized cities with the population of 1–5 million is supposed to increase from 467 to 597, whereas the number of cities with the population of 500,000–1 million inhabitants should change from 598 to 710.

Figure 11 presents the percentage share of urban population in specific geographical areas in 2018. Overall, 48% of global population in 2018 lived in cities below 500,000 inhabitants. The largest share of population in such cities was in Europe (65%) and Africa (55%), whereas the smallest percentage was in North America (32%). Overall, 10% of global population lived in cities of 500,000–1 million inhabitants. There was more than 10% of inhabitants in such cities in North America (12%) and Europe (11%), whereas the smallest percentage was in Oceania (only 2%). On a

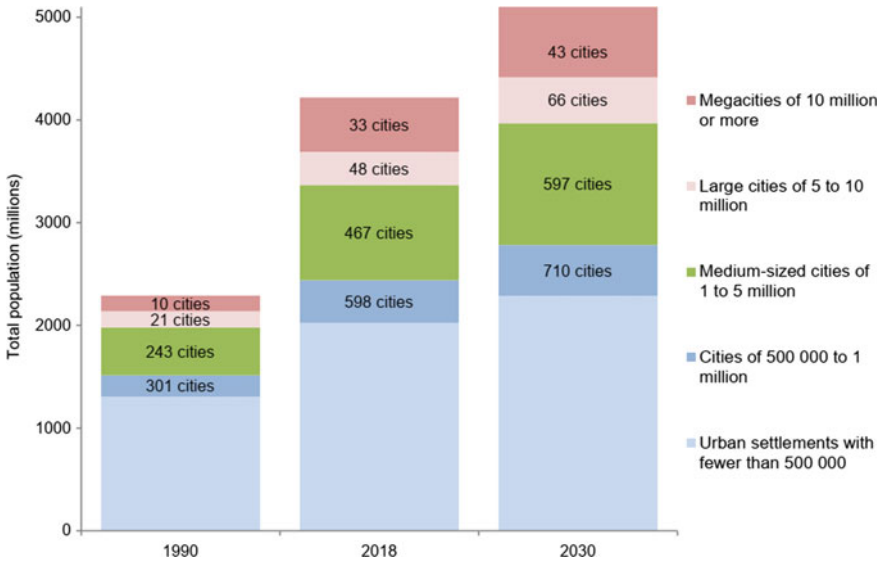

Fig. 10 Population and number of cities in the world by city size in 1990, 2018 and 2030. *Source* [54]

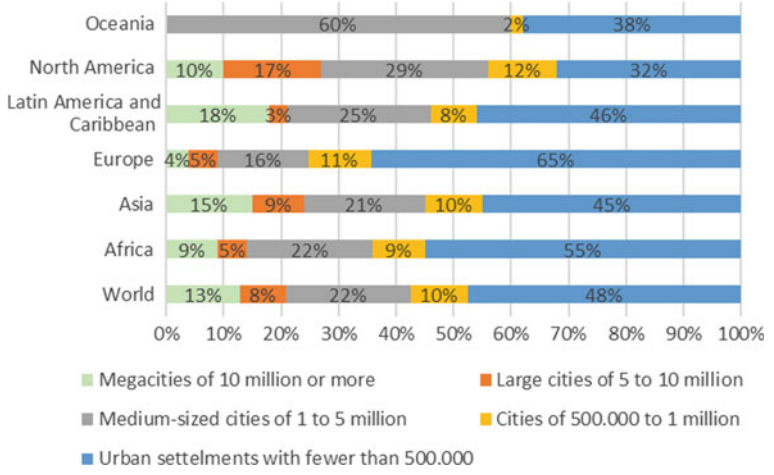

Fig. 11 Urban population in percent in specific geographical regions in 2018. *Source* [54]

global scale, 22% of population lived in medium-sized cities of 1–5 million inhabitants. The largest percentage share of population in cities of this size was in Oceania (60%) and North America (29%), whereas the smallest share was in Europe (16%). In large cities with the population of 5–10 million, the global percentage share of population amounted to 8%. The largest percentage share of population in such cities

was in North America (17%) and Asia (9%), whereas the smallest share was in Latin America and the Carribeans (3%), as well as Europe and Africa (5% each). The total number of global population living in the megacities of 10 million or more inhabitants was 13%. The largest share of this population was in Latin America and the Carribeans (18%), followed by Asia (15%), whereas the smallest percentage share was in Europe (4%). There were no large cities or megacities in Oceania.

Overall, the largest percentage of population in large cities and megacities, i.e. cities with more than 5 million or more inhabitants, was in North America (27%), Asia (24%), as well as Latin America and the Carribeans (21%). They were followed by Africa (14%), while Europe had the smallest share (9%). The largest share of population in cities below 1 million was in Europe (76%) and Africa (64%), then Asia (55%), Latin America and the Carribeans (54%), North America (44%) and Oceania (40%).

The concentration of population and business activity in urbanised areas brings many benefits, but also negative effects. The positive aspects of city development include [55]:

- well-developed social and technical infrastructure (health service, educational, cultural, scientific, commercial and financial institutions),
- diverse labour market,
- enhanced work performance,
- formation of a large sales market,
- specialisation and diversity,
- bigger possibility to choose between different jobs,
- research and development, innovation,
- development of the creative class,
- easy communication and information flow, etc.

On the other hand, the negative effects include:

- excessive emission of dust, greenhouse gases, noise and waste,
- production of huge amounts of municipal and industrial waste, as well as problems with their storage,
- increased costs of public transport operation and residential housing,
- overloaded transport infrastructure and extended commuting time, traffic jams (congestion) on access roads, lack of parking spaces,
- water shortage,
- increase of crime rate and social pathologies,
- increase of aggression and social tensions, problems with immigrants,
- reduced sense of safety among inhabitants,
- increase of the number of homeless and unemployed, as well as the related expansion of poverty districts—social exclusion and poverty,
- social and economic inequalities,
- increased frequency of diseases caused by environmental factors (heart diseases, cancers and chronic diseases of the respiratory system), etc.

Understanding of the key urbanisation trends that may be revealed in the upcoming years is very important for the implementation of the 2030 Agenda for Sustainable Development [56], including the efforts for the preparation of a new development framework for urban areas. With the progressing global urbanisation, sustainable development is increasingly dependent on the effective management of city development, particularly in low- and medium-income countries, where the urbanisation rate is expected to be the fastest. Many countries will face challenges related to fulfilling the needs of the growing city population, including housing, transport, energy systems and other infrastructure, as well as employment and fundamental services, such as education and health care. There is a need for integrated policies, intended to improve the quality of life of city inhabitants based on the already existing economic, social and environmental links. In order to ensure that the benefits of urbanisation are fully shared and contribute to social inclusion, the management policies of city development must provide everyone with access to infrastructure and social services, focusing on the needs of city inhabitants that are particularly sensitive from the point of view of housing, education, health care, decent work and safe environment [57].

The 2030 Agenda for Sustainable Development sets out 17 sustainable development goals together with 169 related tasks. The following goals can be mentioned [56]:

- promotion of stable, sustainable and inclusive economic growth,
- development of stable infrastructure, promotion of sustainable industrialisation and support of innovation,
- making cities and human settlements safe, stable and sustainable places that promote social inclusion.

The following tasks were defined in connection with the specified goals [56]:

- reaching a higher level of economic performance through diversification, technological modernisation and innovations, as well as focusing on sectors with high added value and high work consumption ratio,
- promotion of development policy supporting production activity, entrepreneurship, creativity and innovations,
- building reliable, sustainable, durable and stable infrastructure of good quality, including regional and cross-border infrastructure, supporting the economic development and human well-being,
- until 2030—modernisation of infrastructure and industry to ensure its sustainable development, with the increased effectiveness of resource use and application of clean and environmentally-friendly production technologies and processes,
- until 2030—providing all people with access to safe, affordable, sustainable and easily accessible transport systems, increasing the safety level on roads, especially by public transport development, particularly focusing on the needs of vulnerable groups, i.e. women, children, as well as handicapped and elderly persons,
- until 2030—reduction in per capita ratio of adverse urban impact on the environment, particularly focusing on the air quality, as well as management of municipal waste and other types of waste,

- until 2030—ensuring easy and universal access to safe green areas encouraging social integration and safe public space,
- supporting economically, socially and environmentally beneficial connections between urban, suburban and rural areas by enhancing land use planning at the domestic and regional level.

The above-mentioned statements indicate how great importance is attached to stable, sustainable and inclusive development, supported by IT technologies, innovation and creativity, as well as to safe and available public transport. Apart from the demographic changes related to urbanisation processes, the process of society ageing is a significant trend, especially in the European countries.

The increased share of elderly persons in the population structure most frequently results from two factors: falling birth rate that leads to a decreased share of the youngest age groups and the rise of the average life expectancy due to the development of medicine and ongoing improvement of the living conditions. In the European Union (EU) countries where the urbanisation processes began the earliest, the population aged over 65 in 2006–2016 increased by 2.4% (from 16.8 to 19.2%). For the EU countries, a further increase of the number of elderly persons is forecasted until 2080. The forecast also distinguishes the age group over 80, in which the largest increase of people will take place (2016-5.4%, 2020-5.9%, 2030-7.2%, 2050-11.1% and 2080-12.7%). The percentage of people aged 65–79 will increase at a slower rate (2016-13.8%, 2020-14.5%, 2030-16.7%, 2050-17.4% and 2080-16.4%) [58]. The global percentage of people aged over 60 in 1950 was 8%, in 2010 it was 10%, whereas the forecast for 2050 is 21%.

These megatrends will set new challenges and expectations of the population in urbanised areas regarding the conditions and quality of life. An important aspect is the use of innovative technologies, especially with reference to urban transport system, in order to ensure sustainable urban mobility. In respect of mobility, this concerns activities in the field of: traffic management, car park management, collection of fees for transport and congestion, integrated mobility management, infrastructure for charging electric vehicles and payment solutions [59].

Sustainable mobility covers several aspects and components: sustainable and energy-saving public transport systems; friendly environment for other types of transport, such as cycling and walking; easy access to all districts, on foot, by bike or public transport; local transport networks which must be connected well with the regional networks.

Transport congestion is a very adverse phenomenon, because it directly impacts the urban environment, leading to low air quality, noise emission, high CO_2 level and problems with safety on the road, which is reflected in the assessment of the quality of life in cities.

As results from TomTom Traffic Index report [60], which describes the situation on roads in 403 cities from 56 countries around the world, the biggest congestion problem was in the largest cities in the world. In 2018, the most traffic jammed city was Mumbai (India), where the so-called traffic congestion index was 65%, which means that drivers from the most populous city in India spent 65% more time on

the road in comparison with the average travel time without obstacles. The further positions in the ranking were taken by the capital of Colombia, Bogota (63%), Lima in Peru (58%), New Delhi in India (58%) and capital of Russia, Moscow (56%). The other cities in the global top ten were Istanbul (Turkey), Jakarta (Indonesia), Bangkok (Thailand), Mexico City (Mexico) and Recife (Brazil).

The following European cities had the biggest congestion problems in 2018: Moscow, Istanbul, Bucharest, Saint Petersburg, Kiev, Dublin, Łódź, Novosibirsk, Kraków and Edinburgh.

Among the Polish cities, Łódź reached the highest place in the global ranking, taking the 15th position in the world with the traffic congestion index amounting to 44%. Łódź was also ranked 8th among the European countries. The subsequent positions were taken by: Kraków—40%, Poznań and Warsaw—38%, Wrocław—35%, Bydgoszcz—32%, Gdańsk, Gdynia and Sopot—30%, Szczecin—27%, Lublin and Białystok—25%, Bielsko-Biała—20% and Katowice (agglomeration area)—16%.

Due to this, mobility in cities faces numerous challenges, the most important of which is road congestion and high dependence on cars, which has led to blockage of urban areas. The improvement of sustainable mobility in cities goes beyond the focus on the improvement of efficiency and effectiveness of transport systems, covering also in particular the demand-driven modes of transport, such as the promotion of walking, cycling and reduction of travel needs.

3.2 Mobility in the European Union Documents

The concept of sustainable mobility in cities is related to the goals concerning the improvement of both energy consumption and environmental indicators in cities. The European Commission indicates the need to undertake actions intended for better mobility planning, taking into account the principle of sustainable development [61].

The foundation for creating an integrated transport system in the countries forming the European Union is the common transport policy, the legal basis of which has already been included in the EEC Treaty of Rome [62]. The European Union countries strived to develop a common transport policy and form a coherent transport system, which was the basis for the efficient operation of the internal market. Along with the development of the European Union, further issues and areas covered by the common transport policy appeared, such as e.g.: effective development of transport system, taking into account the rules of market economy and fair competition, liberalisation of transport service market, creation of uniform transport and telecommunications infrastructure, design and development of new transport technologies [63], integration of public and individual transport, ensuring sustainable transport development.

Specific issues were the object of documents published by the European Commission, such as Green and White Books, as well as Communications.

Common transport policy is intended to increase mobility, remove the main barriers in key areas, as well as accelerate the economic growth and increase employment. An important goal is to reduce Europe's dependence on the import of oil and reduce carbon dioxide emission in the transport sector by 60% until 2050. The key goals for 2050 include:

- withdrawing conventionally-fuelled vehicles from use in cities,
- reaching the 40% level of using sustainable low-carbon fuels in aviation,
- reducing the emission level in the maritime transport sector at least by 40%,
- shifting 50% of intercity passenger traffic to medium distance and transport of goods from road to railway and sea.

All these changes are supposed to contribute to reducing total transport emissions in the first half of this century by 60%. Other issues included in the EU transport policy concern infrastructure planning, application of IT technology, safety, passenger rights and international cooperation [64].

Many European cities face difficulties connected with transport and traffic, or the related problems (congestion, air pollution and noise, safety on the road). Taking into account the growing population inhabiting urbanised areas and current problems resulting from the inefficiency of urban transport system, it is necessary to pay more attention to the solutions promoting sustainable urban mobility. Economic and social transformation rapidly increased the mobility level. The growing use of private cars was accompanied by the spatial growth of cities and increase of commuting to work, whereas in many cases the public transport network did not develop at the same rate [65]. The development of current EU urban transport policy has a long history.

In 1992, the European Commission presented the Green Paper on the Impact of Transport on the Environment: A Community Strategy for Sustainable Mobility [66]. The Green Paper contained the assessment of the general impact of transport on the environment and outlined the common strategy for sustainable mobility which should enable transport to perform economic and social functions, while at the same time reducing harmful environmental effects. Special attention was paid to air pollution, noise and congestion problem, which was defined as a recurrent temporary phenomenon of variable duration, resulting from the lack of balance between the demand and supply of transport infrastructure capacity. The effect of this lack of balance is the overloading of transport infrastructure and congestion. It has been noticed that congestion, which is characteristic for urban traffic, also begins to be a problem in air transport. The basic consequences of the congestion phenomenon in cities include the possible reduction of mobility, increase of pollution and energy consumption, as well as ineffective use of time. Moreover, other identified possible effects of congestion include the loss of comfort and well-being, decrease of income and production, as well as reduced rest time. The following instruments that can be used for reducing congestion were indicated: proper public transport systems with a high utilisation rate, traffic management systems, road tolls and restricted availability of crowded areas for passenger cars. The purpose of this document was to initiate a public debate on how to reach the goals of the presented strategy for sustainable mobility.

The Green Paper was also connected with the European Commission's statement of 1998 entitled Common Transport Policy—Sustainable Mobility: Perspectives for the Future [67]. This document emphasized the significance of integrated transport systems, easily available and safe transport services, including in peripheral and less developed regions, in order to increase the competitiveness of Europe, economic growth and employment. High importance was attached to technical progress and telematics in effective and sustainable development of integrated transport systems as one of the key priorities for the Commission. The improvement of the quality of local public transport, which is the only form of transport available to all citizens (especially in large cities), was indicated as a great challenge. The document also highlighted the negative transport impact on the natural environment, because the development of transport systems cannot take place at the expense of the quality of life of citizens, or cause environmental degradation. Therefore, environmental protection was considered to be an integral part of the transport policy and the need was identified to enhance the environmental assessment by political initiatives that have significant impact on the environment [68]. It was emphasized that common transport policy is a developing, dynamic instrument designed in order to provide an integrated European transport system.

On 12 September 2001, the Commission of the European Communities presented the White Paper "European Transport Policy 2010: Time to Decide" [69]. It outlined the directions of transport policy of the European Union until 2010, emphasizing the importance and validity of the previous goal of the EU transport policy, i.e. sustainable development, indicating the need to manage the development of transport system in a more sustainable way. The document highlighted the disparities in the development of specific modes of transport and domination of road transport. Congestion, whose external costs (only in road transport) were estimated at approximately 0.5% of the Gross Domestic Product of the European Community, was named as a serious risk of losing competitiveness by the European economy. It was also assessed that if no actions are taken in this respect, the expected traffic growth by 2010 will also cause an increase of congestion costs even by 142%, thus reaching the total annual amount of EUR 80 billion, which is 1% of GDP of EC. The problem of congestion was partly explained by the fact that transport users do not always pay the costs that they generate. As a result, the price structure does not generally reflect the entire costs of infrastructure, congestion, environmental impact and accidents. The White Paper included sixteen specific proposals to be undertaken at the community level as part of the transport policy. The development of high quality urban transport was indicated among the detailed proposals. The Community suggested giving priority to better use of public transport and existing infrastructure in the light of the general degradation of the quality of life of European citizens.

The following stage of EU transport policy consisted in adopting the "Green Paper—Towards a New Culture for Urban Mobility" on 25 August 2007 [70]. Urban mobility was recognised there as an important factor contributing to economic growth and employment, having a great impact on sustainable development in EU. The document presented a new approach to urban mobility, consisting in the optimised use of different modes of public and individual transport, as well as creating good

conditions for the execution of intermodal journeys by means of various public transport systems (railway, metro, bus, taxi) and individual transport (car, motorbike, bike, walking). The following five main challenges concerning transport in cities that require an integrated approach were specified:

- increase of traffic fluidity in the cities,
- problems related to excessive use of passenger cars and road transport,
- implementation of smart transport systems,
- improvement of the availability of public transport,
- increase of the reliability and security of public transport.

Certain possible activities were indicated in order to face these challenges. In order to increase the traffic fluidity in cities, efforts should be made to raise the attractiveness of alternative forms of movement, in particular public transport, bike transport and pedestrian movements. This also includes promotion of new solutions, such as the joint use of one car for commuting to work and school, integration of public and individual transport thanks to the creation of Park&Ride transport nodes, proper infrastructure management, popularisation of ecological and energy-saving vehicles, smart traffic management systems, toll collection, etc. Particular attention was paid to the development of new urban mobility culture through education, trainings and raising awareness of the importance of sustainable mobility. The problem of mobility is complex and covers several interrelated aspects (environmental, economic and social). The examples of actions named included encouraging eco-driving (in driving schools and courses for professional drivers), thanks to which the energy consumption is reduced. Another specified item was the significance of user-friendly, proper and interoperable multimodal travel information when planning journeys, to provide travellers with the possibility of conscious choice of modes of transport and travel time. Attention was also paid to the need to develop uniform rules on green zones in cities (pedestrian only zones, restricted access zones, speed limits, urban tolls, etc.) at the EU level in order to enable application of similar solutions to a wider extent, without creating disproportionate obstacles for the mobility of people and goods at the same time.

As specified in the Green Paper of 2007 "Towards a New Culture for Urban Mobility", there is no single solution for reducing congestion in cities. The problems of urban mobility are strictly related to the main features of modern economy and society (hypermobility of people, goods and information) and have a big impact on the structure and organisation of a majority of global metropolitan areas [71]. Therefore, ecological solutions should be developed and promoted in order to reduce the negative impact of transport on the urban area environment, i.e. harmful emission, noise, etc. [72].

Another document concerning urban mobility is the Communication from the European Commission—"Action Plan on Urban Mobility" [73] of 2009, indicating practical actions to address the problems of sustaining mobility in cities in an integrated manner. The proposed actions cover six basic areas:

- promoting integrated policies (accelerating the take-up of sustainable urban mobility plans, sustainable urban mobility and regional policy, transport for healthy urban environments),
- focusing on citizens (platform on passenger rights in urban public transport, improving accessibility for persons with reduced mobility, improving travel information, access to green zones, campaigns on sustainable mobility behaviour, energy-efficient driving as part of driving education),
- greening urban transport (research and demonstration projects for lower and zero emission vehicles, Internet guide on clean and energy-efficient vehicles, study on urban aspects of the internalisation of external costs, information exchange on urban pricing schemes),
- strengthening funding (optimising existing funding sources, analysing the needs for future funding),
- sharing experience and knowledge (upgrading data and statistics, setting up an urban mobility observatory, contributing to international dialogue and information exchange),
- optimising urban mobility (urban freight transport, intelligent transport systems (ITS) for urban mobility).

The document outlines that urban mobility consistent with the rules of sustainable mobility has a growing importance in relations with neighbours and global society, which is increasingly concentrated in urban agglomerations.

2010 marked the creation of the Community development strategy, which also raises the issues of sustainable mobility. Europe 2020—A strategy for smart, sustainable and inclusive growth [74] is a document outlining the long-term vision of the development of the European Union until 2020. Europe 2020 puts forward three mutually reinforcing priorities:

- smart growth: developing an economy based on knowledge and innovation;
- sustainable development: promoting a more resource efficient, greener and more competitive economy;
- inclusive growth: fostering a high-employment economy delivering social and territorial cohesion.

The problems of urban transport and mobility were included as part of actions towards smart and sustainable development.

In the White Paper "Roadmap to a Single European Transport Area—Towards a competitive and resource efficient transport system" of 2011, ten goals were set for a competitive and resource efficient transport system. The document outlined that further development of the transport sector should be based on several assumptions, including e.g.: improving the energy efficiency performance of vehicles across all modes (developing and deploying sustainable fuels and propulsion systems), optimising the performance of multimodal logistic chains, as well as using transport and infrastructure more efficiently thanks to application of improved traffic management and information systems. For urban areas, development of strategies involving e.g.

land-use planning, pricing schemes, introduction of intelligent intermodal ticket system, efficient public transport services, infrastructure for non-motorised modes and charging/refuelling of clean vehicles were indicated as necessary. Creation of better conditions for walking and cycling should also become an integral part of urban mobility and infrastructure design.

In Annex I to the White Paper "List of Initiatives", the analysis of the possibility to introduce mobility plans as the obligatory solution for cities of specific size was specified as one of the actions to be taken [75]. The recommendations included in the document whose time horizon reaches 2050 concern the following areas:

- growing transport sector and supporting mobility while reaching the 60% greenhouse gas emission reduction target,
- development of an efficient core network for multimodal intercity travel and transport,
- global level-playing field for long-distance travel and intercontinental freight,
- clean urban transport and commuting,
- specifying goals for a competitive and resource efficient transport system.

The document identified the need to provide systemic support for the development and implementation of mobility plans, as well as to include such plans in the context of distribution of EU funds. Cities above a certain size should be encouraged to develop urban mobility plans, fully aligned with integrated urban development plans. In the urban context, it is necessary to reduce congestion, noise and emission of harmful substances, because these are the biggest problems in cities. Switching to cleaner transport in cities is facilitated by lower requirements for vehicle range and higher population density, which will contribute to gradual elimination of conventionally-fuelled vehicles from cities. New technologies for vehicles and traffic management will also have an impact on reducing transport emissions. Moreover, it has been found that information and communication technologies have the potential to satisfy certain accessibility needs without additional mobility.

In December 2013, the European Commission adopted the Urban Mobility Package, reinforcing its supporting measures in the area of urban transport by:

- sharing experiences, show-casing best practices and fostering cooperation,
- providing targeted financial support,
- focusing research and innovation on delivering solutions for urban mobility challenges.

The central element of the Urban Mobility Package is the Communication "Together towards competitive and resource efficient urban mobility" [76]. According to the European Commission, a step-change in the approach to urban mobility is required to ensure that European urban areas develop along a more sustainable path and that EU goals for a competitive and resource-efficient European transport system are met. It is also crucial to overcome fragmented approaches and develop the single market for innovative urban mobility solutions by addressing the issues such as common standards and specifications or joint procurement. The implementation of systemic actions towards sustainable mobility requires cooperation between public

entities at all levels of government and involvement of the private sector. It is supplemented by an annex that presents the concept of Sustainable Urban Mobility Plan, as well as four working documents on urban logistics, regulations concerning access to cities, implementation of intelligent transport system solutions in cities, as well as areas and safety of urban road traffic. The Commission decided that urban mobility is primarily a duty of relevant units at the local level and focused on developing new integrated strategies for sustainable urban mobility, as well as transport plans that may constitute the basis for their successful implementation. In this context, the Commission presented the concept of Sustainable Urban Mobility Plans (SUMP) and also focused on the following areas: urban logistics, urban access regulation, deployment of ITS solutions in urban areas and urban road safety [77]. In particular, the high potential of ITS for optimisation of urban mobility and achievement of policy goals, such as e.g. increasing safety and reducing congestion, was highlighted. With reference to urban logistics, it is possible to contribute to reducing noise and congestion, as well as to improving travel effectiveness thanks to better management. On the other hand, the regulations concerning vehicle access to urban traffic may restrict the use of highly polluting vehicles, as well as encourage the use of quieter, low-carbon vehicles. Thanks to the road traffic safety measures, it is possible to encourage better vehicle handling, which should contribute to reducing the general level of emission, while at the same time reducing the number of accidents in transport network and the related congestion. The importance of information technologies in supporting new mobility patterns was emphasized, based on the interconnected use of all modes of transport (e.g. multimodal journeys), information about road traffic in the real time, integrated multimodal electronic toll systems, as well as the programmes for joint use of cars and bikes.

SUMP is a strategic plan created in order to fulfil mobility needs of people and economy in cities and their surroundings to achieve a better quality of life. It is based on the existing planning practices and takes into account the principles of integration, social participation and process evaluation. The goal of SUMP is to present targeted integrated actions, clearly leading to a growth of sustainable transport and increase of society mobility in the area covered by planning [78]. For the purpose of effective implementation of SUMP, it is necessary to use a number of instruments, measures, tools and strategies that will consequently enable sustainable urban mobility. The basic instruments include legal, planning, investment, financial instruments, as well as instruments related to the creation, sale and reservation of mobility products, coordination and organisation of transport solutions and services, educational, informational and promotional activities that may influence a change in the transport behaviours of urban population [79–81]. A significant role in these solutions is attributed to public urban transport, which may become a more attractive form of movement than personal car thanks to certain technical, economic and organisational solutions. Moreover, attention was paid to the fact that instruments that are part of sustainable urban mobility should increase the number of people walking, cycling and using public transport, thus not only contributing to reduction of emission and noise generated by road traffic, but also leading to higher availability for everyone and

bigger equality in transport system, increase of physical activity and improvement of public health.

The document of the European Commission—Communication from the European Commission to the European Parliament, the Council, the European Economic and Social Committee, as well as the Committee of the Regions—European Strategy for Low-Carbon Economy was announced in 2016 [82]. The Communication stated low-carbon mobility as the necessary element for increasing transition to closed-loop low-carbon economy, which is required for Europe in order to maintain its competitiveness and be able to adjust to the needs in respect of the mobility of individuals and the movement of goods. It was also emphasized that digital technologies could make transport safer, more effective and inclusive. For the best use of their potential, these technologies must be well integrated with the mobility concepts that are consistent with the principles of sustainable development. Due to this, the implementation of intelligent transport systems in all types of transport becomes an integral part of the development of multimodal trans-European transport network. Digital technologies have a strong potential for optimisation of the transport system and create many options for the production sectors. These technologies also support transport integration with other systems, such as the energy system, and increase the effectiveness of operations in the mobility sector. The perspectives for development of low-carbon alternative energy sources in specific types of transport are different. The widest range of options currently exists with reference to passenger cars and buses. The goal of activities for low-carbon mobility is to increase the effectiveness of transport system, as well as alternative low-carbon energy sources for the purpose of transport and development of low-carbon and zero emission vehicle market.

The application of digital solutions in transport is consistent with the Directive of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport [83]. Intelligent Transport Systems (ITS) are information and transport systems intended to provide services related to various modes of transport and traffic management, delivering better information to different users, as well as ensuring a more secure, coordinated and 'intelligent' use of transport networks. They are intended for traffic management, mobility management and may cooperate with similar systems applied in other types of transport. Intelligent Transport Systems (ITS) constitute a set of tools based on IT and telecommunications technologies, as well as telematics solutions applied in order to increase the effectiveness and integration of the entire transport system in a city according to the rules of sustainable development [84].

In May 2016, twenty-eight ministers with representatives of other EU institutions and representatives of European cities signed the Pact of Amsterdam concerning the so-called Urban Agenda for the EU, a document laying down the rules for implementation of the urban agenda [85]. Urban Agenda for the EU is a forum [86] attended by the Commission, national ministries, municipal authorities and other stakeholders. The goal is to develop better regulations, facilitate access to financing and exchange knowledge of important subjects from the perspective of cities [85].

It established cooperation between various authority levels in EU, as well as business and social partners within the framework of partnerships in 12 priority areas. Thanks to the establishment of partnerships with the participation of municipal authorities, Member States, EU institutions and other stakeholders, including non-governmental organizations and enterprises, Urban Agenda will contribute to supporting the economic and social development of Europe. Its goal is to provide citizens with new opportunities, improve their quality of life and meet the key challenges faced by cities—starting from the problems of employment and social inclusion, ending with mobility, environment and climate changes, because successful development of cities has a big impact on the economic, social and environmental growth across Europe, and therefore, it is the key element of implementation of goals for intelligent and durable economic growth that supports social inclusion. The priority areas of the Urban Agenda include [87]:

- air quality,
- closed-loop economy,
- adjustment to climate change,
- digital transition,
- energy transition,
- housing,
- social inclusion of migrants and refugees,
- innovative and responsible public procurement,
- jobs and skills in the local economy,
- sustainable land use and solutions based on natural resources,
- urban mobility,
- urban poverty.

Priorities in the social and economic aspect include creation of new jobs and development of education as part of local economy, fight against poverty, solving problems related to housing and mobility, as well as initiatives supporting the integration of foreigners and refugees. Much attention was also paid to environmental challenges, including sustainable land-use planning, building circular economy, adjustment to climate changes, energy consumption and air quality. The key rules of Urban Agenda include [88]:

- working method based on partnership,
- mechanism of cooperation on many levels,
- focus on integrated approach,
- sustainable development strategy,
- fulfilment of UN Sustainable Development Goals,
- building functional urban areas,
- building connections between urban and rural areas,
- adjustment to the needs of cities of all sizes.

The goal of Partnership for Urban Mobility (PUM) was to offer solutions to improve the framework conditions of urban mobility in cities across EU. The solutions were related to problems important for technological progress, encouraging the

use of active modes of transport, improving public transport and promoting multi-level management measures. Initially, PUM put an emphasis on the following four subjects: active modes of transport and use of public space, innovative solutions and smart mobility, public transport for the city/region, as well as multimodality and management. Having identified the challenges, bottlenecks and potentials, specific working groups were defined in order to develop the action plan intended to improve: (a) EU regulations concerning urban mobility, (b) use and allocation of EU funds, as well as (c) platforms for exchange of knowledge and their use [89].

In 2017, the European Commission announced the White Paper on the future of Europe. Reflections and scenarios for the EU27 by 2025 [90]. This document presented five potential scenarios intended to support the debate about the future of Europe, each of them based on the assumption that the European Union will still consist of 27 Member States. The scenarios are as follows:

- Scenario 1: Carrying on—the European Union focuses on delivering its positive reform agenda.
- Scenario 2: Nothing but the single market—the European Union is gradually re-centred on the single market.
- Scenario 3: Those who want more do more—the European Union allows willing Member States to do more together in specific areas.
- Scenario 4: Doing less more efficiently—the European Union focuses on delivering more and faster in selected policy areas, while doing less elsewhere.
- Scenario 5: Doing much more together—the European Union decides to do much more together across all policy areas.

There were advantages and disadvantages specified for each scenario. Each scenario also determined the impact of actions on uniform market and trade, economic and monetary union, Schengen Area—migration and safety, foreign policy and defence, as well as ability to act.

During the unofficial meeting of EU Ministers Responsible for Urban Matters in Bucharest on 14 June 2019, the Declaration of Ministers "Towards a common framework for urban development in the European Union" was adopted [91]. The Declaration emphasized that cities and urban areas play an important role in delivering EU priorities. The development of urban areas has a large potential to contribute to territorial cohesion of the EU by creating positive externalities beyond urban areas. It is crucial to pursue the added-value of the integrated territorial development and 'urban ownership' as promoted by the Cohesion Policy. Finally, it is necessary to continue the efforts towards the Urban Agenda for the EU process and to actively support the development and the implementation of actions under the Urban Agenda for the EU.

Further documents were issued in January 2019: Document opening the Reflection Paper "Towards a Sustainable Europe by 2030" [92] including three annexes. Annex I: The Juncker's Commission's contribution to the Sustainable Development Goals [93], Annex II: The EU's performance on the Sustainable Development Goals [94] and Annex III: Summary of the contribution of the SDG Multi-Stakeholder Platform to the Reflection Paper "Towards a Sustainable Europe by 2030" [95]. The Reflection

Paper "Towards a Sustainable Europe by 2030" outlined the key factors enabling changes towards a sustainable Europe by 2030:

- education, science, technology, research, innovation and digitisation,
- finance, pricing, taxation and competition,
- corporate social responsibility,
- open and rules-based trade,
- governance and policy coherence,
- EU as a global trail blazer.

The document outlines three scenarios of effective actions towards the implementation of SDGs [96]:

- Scenario 1: An overarching EU SDGs strategy to guide all actions by the EU and Member States
- Scenario 2: Continued mainstreaming of the SDGs in all relevant EU policies by the Commission, but not enforcing Member States' action
- Scenario 3: Putting enhanced focus on external action while consolidating current sustainability ambition at the EU level.

In this way, the Commission began discussion on sustainable development in the future as part of a broader debate initiated in March 2017 by the White Paper for the future of Europe [90].

Annex I: The Juncker's Commission's contribution to the Sustainable Development Goals [93], with regard to urban mobility specified that in consequence of the strategy towards low-carbon mobility, the Commission adopted three packages supporting "Europe on the Move" mobility, in 2017 and 2018 respectively. "Europe on the Move" is a broadly designed set of initiatives that will increase the traffic safety, encourage to implement intelligent road toll collection systems, as well as reduce carbon dioxide emission, air pollution and traffic congestion. For this purpose, the initiatives have adopted an integrated policy for the future of road traffic safety, providing measures for the security of vehicles and infrastructure; the first ever CO_2 standards for heavy-duty vehicles; a strategic action plan for the development and manufacturing of batteries in Europe and a forward-looking strategy on connected and automated mobility.

Joint Research Centre (JRC) of the European Commission published in 2019 a report on "The Future of Cities—opportunities, challenges and the way forward". The report is a part of "Facts4EUFuture", a series of reports on the future of Europe. "The Future of the Cities" report was presented during the European Week of Regions and Cities on 11 October 2019, identifying trends, asking questions and provoking discussions on what the future of cities may and should be [97]. According to the report, some cities in Europe will grow, while others will decrease, whereas it is expected that urban population will continue to grow in a majority of Earth. Brussels, Luxembourg and Stockholm may grow by over 50% by 2050. 25–50% increase by 2050 is expected mainly in medium-sized capital cities, such as Vienna, Budapest, Prague, and big regional cities in France, as well as Munich and Bologna. The population decrease exceeding 25% will mainly take place in small and less populated

cities in eastern Germany, Spain, Latvia, Lithuania and Bulgaria. Europe will have to face challenges related to the decrease and ageing of population in many cities. The report also indicated other trends:

- It is expected that a majority of European cities will increase geographically, and cities will have to recognise better the importance of optimising the way that their public space is designed and used.
- The ageing EU population will require further adjustment of infrastructure and services.
- Cities will increasingly use new technologies and innovations in transport and mobility. These technologies will have to integrate seamlessly with one another and bring benefits to all citizens.
- The car dominance could be drastically reduced in favour of more efficient public transport, as well as shared and active mobility. Transport demand can also be reduced by means of new working patterns.

Shaping urban mobility requires coordinated actions on the part of decision-makers and relevant authorities at all administration levels. The European Commission has been actively supporting and initiating cooperation projects related to sustainable urban mobility for decades, beginning with research, development of tools, presentations, trainings, popularisation and other measures for exchange of knowledge.

Generally speaking, the improvement of urban mobility consists in changing the mobility culture of planners, decision makers and users. Since private cars better satisfy the user requirements concerning the safety, reliability and availability of mobility needs, the planners and decision makers mainly face the challenge of providing effective alternatives to car. This also concerns research and innovation, as well as development of smart and innovative solutions for public transport systems. The problem of urban mobility is a priority for the EU, but it also becomes increasingly important in other regions of the world, taking into account the trends in urbanisation, car ownership and public transport. In the future, the urbanisation rate will mainly concern the developing countries. The forecasts regarding global vehicle fleet also show that it is supposed to grow from 800 million to 2–3 billion, because middle class in the developing countries is becoming richer and more dependent on private cars. Regardless of the concerns related to energy supplies, climate changes or congestion costs, it is expected that the share of public transport in modal transport during the upcoming decade will decrease in all parts of the world [98].

Eltis—The Urban Mobility Observatory is a platform that plays an important role in supporting activities in the field of planning sustainable urban mobility. The urban mobility website Eltis was launched in 2000. It has become the central website for all problems related to urban mobility. Eltis facilitates an exchange of information, knowledge and experiences in the area of sustainable urban mobility in Europe [99].

4 Transport Behaviours of the Polish Creative Class

4.1 Characteristics of the Study Group

The term "creative class" was proposed by R. Florida in his paper from 2002 entitled "The Rise of the Creative Class" [100]. The basis for identification of this social group is performance of work that consists in creating new and significant forms. This division is strongly connected with the direction of professional activity of its representatives. R. Florida distinguished two subgroups of the creative class:

- super-creative core formed by scientists, engineers, artists, designers and architects, programmers, representatives of opinion leaders (e.g. non-fiction authors, publishers, analysts),
- creative professionals working in the fields that require advanced knowledge and skills, e.g. individuals employed in legal professions, hi-tech sector, financial services industry, health protection and management specialists.

The cross section of creative class is very broad from the perspective of professional activity, and the common factor is the lack of repeatability of work performance. According to R. Florida, the core of the creative class is focused not only on solving problems, but also, or perhaps mainly, on looking for such problems. The creative class is supplemented by representatives of the group of creative professionals whose actions are repetitive, but require professional knowledge and independent thinking. R. Florida has concluded that growth of the creative class is a characteristic distinctive mark of postindustrial societies. The hypotheses proposed by R. Florida quickly became a subject of further research, which has focused on three main areas: precise delimitation of the creative class, impact of the creative class on economy and mobility of this social group with regard to selection of the workplace and residence. The existing results of research on the creative class have been presented synthetically in Table 4.

Based on the presented research results, it may be concluded that the creative class is a driving factor for local and regional development. Its representatives are usually well-educated, implement non-standard projects, living in an open and tolerant environment. R. Florida described the development model related to the existence of the creative class using 3T: technology, talent, tolerance. Due to its social status, the creative class is opinion-forming, whereas its representatives are development leaders in their own local communities. Due to the presented characteristics, in the opinion of the authors, the creative class will be more willing to implement sustainable urban mobility, because:

1. The group members have a stable economic situation, so they will have a less negative attitude to restrictive activities, e.g. limitation of traffic for older vehicles (or diesel-engine vehicles) in the city centre.
2. Due to international contacts (e.g. work in a global company) and higher tendency for travel, they are willing to refer to foreign models in the context of solving local transport problems—e.g. road congestion, etc.

3. Representatives of the creative class are aware of the problem of transport impact on the environment (including natural environment) and are capable of changing their own transport habits with a view to improving the natural environment.
4. They are not concerned about the contact with modern technology and adapt to new solutions faster than the rest of the society.
5. A characteristic feature of the creative class is their openness and tolerance, which is also manifested by the acceptance for transport behaviours of other people who e.g. use the bike in commuting to work, etc.

For the above reasons, it was concluded that representatives of the creative class may be the foundation for implementing the instruments of sustainable urban

Table 4 Review of research on the role of the creative class in society and economy

Research authors	Method and scope	Main results
Boschma and Fritsch [101]	Analysis covering over 450 regions from 8 European countries	• Geographical distribution of the creative class is very uneven • Urban centres as such do not attract representatives of the creative class; it should be noted that the regional atmosphere of openness and tolerance has a significant and positive impact on the increase of the percentage of the creative class • The creative class has a positive and significant impact on the growth of employment and establishment of new companies at the regional level • Human capital measured by creative professions exceeds indicators based on formal education in terms of reliability
Mellander et al. [102]	Analysis of data from over 60 countries in terms of correlations between: happiness/creative class and income/economic level,	• There is a positive correlation between happiness (living satisfaction) and tolerance and social openness • GDP per capita and the percentage of the creative class have a significant impact on the perception of general happiness and living satisfaction • In the countries with relatively low income, GDP value has a higher impact on citizen satisfaction, whereas in the countries with relatively high income, it was demonstrated that the share of the creative class has a bigger impact on the level of satisfaction than economic indicators

(continued)

Table 4 (continued)

Research authors	Method and scope	Main results
Florida et al. [103]	Mathematical model of relations between the human capital and regional development of Canada, based on structural equations	• Tolerance and openness contribute to the development of the creative class • Tolerance plays a very important role in the regional development • The creative class is a better indicator describing the level of human capital than the average level of education or number of people with higher education
Florida et al. [104]	Mathematical model of relations between the human capital and regional development, based on structural equations, for the data from 331 metropolitan areas in the USA	• Creative sectors such as engineering, IT, management, business and financial services have a very significant impact on the regional development • The artistic circles are not only responsible for the consumption of regional resources, but also contribute to economic growth • Tolerance plays a significant role in attracting the creative class
Clifton [105]	Analysis of correlations and regressions between statistical data from the Great Britain	• The representatives of the creative class constitute approximately 37% of the inhabitants of England and Wales • The geographical distribution of the creative class is uneven—metropolises are the main attractive force • There is a high concentration of the creative class in the places that are tolerant, diversified and provide the possibility of participating in culture
Mellander and Florida [106]	Mathematical model of relations between the human capital and regional development of Sweden, based on structural equations	• The functioning of the creative class and industries better explains the income distribution than the traditional measures related to the education level • Representatives of artistic professions play an important role in the regional development process • The factors attracting representatives of the creative class include: openness, tolerance, technology

(continued)

Table 4 (continued)

Research authors	Method and scope	Main results
Lorenzen et al. [107]	Analysis of distribution of the creative class in Europe based on data from 445 cities	• Generally speaking, the creative class is characterised by a serial distribution of volumes; positive correlation between the city size and concentration of the creative class was demonstrated • The distribution has three stages, depending on the city size • In the case of small cities, i.e. below 70,000 inhabitants, the tendency for proportional growth of the European creative class is 1.52 times more negative, whereas in the case of cities above 1.2 million inhabitants, it is 1.13 times more positive
Stryjkiewicz and Męczyński [108]	Questionnaire survey conducted among representatives of the creative class from 13 European countries (including Poland)—ACRE project	• Mobility (understood as a change of residence) of the European creative class is significantly lower than in the case of American models • Average 48% of respondents worked in their place of birth, whereas there were significant discrepancies between specific countries • The following personal circumstances played the most important role in the choice of residence and job: place of birth and proximity of the family • Another element having an impact on the nature of the creative class mobility where was so-called hard factors, such as: structure of labour market, level of remuneration and obtained education • In terms of significance, the lowest classified factor was the soft conditions connected with the quality of life and working environment

mobility. Such people should be role models, especially in breaking the transport stereotypes that still exist in Poland (e.g. perception of car as a symbol of social status).

The goal of this chapter is to present the results of research on transport behaviours and postulates made by representatives of the creative class in Poland. The research was conducted on a target group, in three Polish metropolitan centres: Warsaw, Tricity and Silesia Metropolis (GZM).

Warsaw is the capital city, located in the central part of Poland, in Mazovia Province. It is characterised by the largest surface and highest number of population among Polish cities. Due to its nature, Warsaw is the centre of government and regional administration. Seats of many global companies are also located here. Warsaw has the leading position among Polish cities in providing services for business [109] and in the number of *start-up* projects located in the city [110]. Warsaw is an example of monocentric agglomeration, composed of one dominating main centre (core) with satellite towns and urbanised rural areas. The other centres covered by the research are polycentric, i.e. they consist of several main centres having a similar potential. Tricity, located in the Pomerania Province, includes three major cities: Gdańsk, Gdynia and Sopot, as well as a number of smaller towns. Similarly, as in the case of Warsaw, Tricity also plays an important role in terms of business, trade (especially related to sea traffic operation) and development. The study of behaviours of the creative class also covered people working in Silesia Metropolis (GZM). This area is a conurbation, and its core consists of thirteen neighbouring cities with district rights. Silesia Metropolis is located in the central part of Silesia Province, in southern Poland. A characteristic feature of this area is the existence of many practically equal urban centres where industry, modern technologies and well-developed academic network are concentrated. The basic parameters for the analysed areas were presented in Table 5.

In each of the above-named centres, 150 PAPI interviews were carried out. As a result, 450 fully completed questionnaire surveys were obtained for the entire study. The research was conducted from 15 July to 15 September 2019. The sample selection was targeted, whereas the study was carried out by the Research and Knowledge Transfer Centre of the University of Economics in Katowice. Due to the specific nature of the group, the research was conducted in selected enterprises that met the following two criteria: they were based in the above-named metropolises and classified in the creative industry group.

The professional structure of the research participants was as follows:

Table 5 Characteristics of the areas covered in the research on the creative class

Data range	Number of inhabitants (people)	Surface (km^2)	Number of passenger cars (vehicles)	Population density (people/km^2)	Motorization index (vehicles/1000 people)
Warsaw[1]	1,777,972	517	1,332,923	3439	750
Tricity[2]	748,986	414	463,543	1809	619
Silesian metropolis[3]	1,758,096	1065	938,049	1651	534

[1]Data for the city of Warsaw
[2]Aggregate data for: Gdańsk, Gdynia, Sopot
[3]Aggregate data for: Bytom, Chorzów, Dąbrowa Górnicza, Gliwice, Katowice, Mysłowice, Piekary Śląskie, Ruda Śląska, Siemianowice Śląskie, Sosnowiec, Świętochłowice, Tychy, Zabrze
Own study based on [111]

- artistic activity: 57.56%,
- research and development: 36.44%,
- advertising industry: 6.00%.

The general gender structure of the respondents involved in the study was: 61% women and 39% men. The results in particular metropolises do not show any significant differences. Only in Tricity, the percentage of women fell to 53%. For comparison, the population structure according to gender for the entire Poland in 2018 amounted to: 52% women, 48% men.

In the course of the conducted survey, a group of respondents coherent in terms of "metrics" (representatives of the creative class) was identified. A statistical member of this group is characterised by the following parameters:

- average age approximately 40–41,
- good assessment of the subjective economic situation,
- higher education.

When conducting the research using the survey questionnaire, the nature and location of work performance were applied. The respondents were not asked about the residence, because it is not important from the point of view of identification of the creative class. Narrowing down the number of locations to three metropolises is not accidental. In this way, responses were obtained from representatives of the southern, central and northern part of Poland. The metropolitan areas included in the study are also characteristic in terms of their transport conditions.

4.2 Survey Results

The representatives of the creative class consider car to be an important element of their journeys. The average number of passenger cars in households was 1.17 (with the median value equal to 1). The detailed data for particular metropolises are as follows:

- Warsaw: 1.18,
- Tricity: 0.99,
- Silesia Metropolis: 1.35.

Table 6 presents the structure of households in terms of the number of cars owned. The presented data indicate high attachment to car. The growing motorization index in Poland is a real phenomenon and shows a strong growing trend (Fig. 12). In the group of the respondents, only 14.2% households do not have a passenger car on the average, whereas 59.1% households have one passenger car and 22.9% households have two vehicles. These results are significantly different in the case of Silesia Metropolis, with a clear tendency of the inventory to increase. In this case, as much as 32% of households have two vehicles, 6% of households have three cars, and 2% of

Table 6 Number of cars in the households of respondents

Data range	No car (%)	1 car (%)	2 cars (%)	3 cars and more (%)
Overall	14.2	59.1	22.9	3.8
Warsaw	8.1	67.1	22.8	2.0
Tricity	18.0	66.7	14.0	1.3
Silesia metropolis	16.0	44.0	32.0	8.0

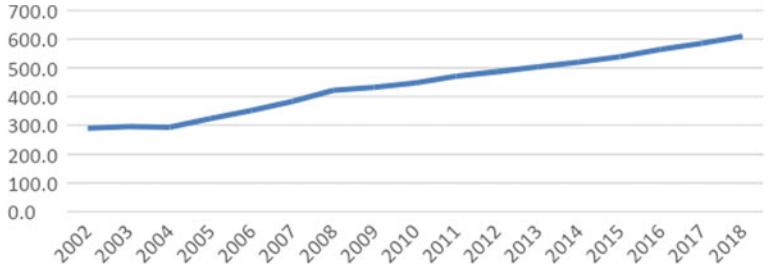

Fig. 12 Number of cars per 1000 inhabitants in Poland

households have more than two vehicles. The result of Warsaw is partly surprising—despite the difficult traffic conditions and good public transport offer, the attachment to individual car transport is still strong and very noticeable.

Figure 13 shows the structure of automobiles according to the engines used. This structure of vehicles owned by respondents according to propulsion type is dominated

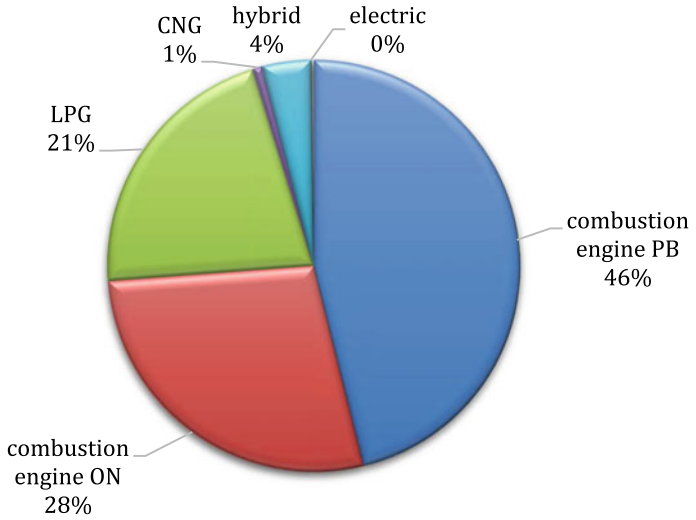

Fig. 13 Structure of car engines of the respondents

Table 7 Number of two-wheeled vehicles in households of the respondents

Data range	No two-wheeled vehicle (%)	1 vehicle (%)	2 vehicles (%)	3 vehicles and more (%)
Overall	32.2	37.8	19.8	6.9
Warsaw	31.3	44.7	18.0	3.3
Tricity	30.0	46.0	20.7	2.7
Silesia metropolis	35.3	22.7	20.7	14.7

by combustion engines: petrol (46%) and diesel (28%). The third group in number is vehicles with LPG gas installation. Low-carbon vehicles with hybrid or electric propulsion are not very popular among the respondents. The possession of 20 hybrid cars and only 1 electric car was declared among the entire examined group.

The respondents were also asked about the two-wheeled vehicles (Table 7): in the case of Warsaw and Tricity approximately 30% of households do not have a two-wheeled vehicle, whereas 44–46% of households have one such vehicle. A totally different structure exists in Silesia Metropolis, where, on the one hand, the highest percentage of households without a two-wheeled vehicle was recorded, and on the other hand, as much as 21.4% of respondents declared the possession of 3 or more vehicles. A probable factor having impact on this solution is the above-mentioned distances in the area of Silesia Metropolis, resulting from a lower concentration of workplaces, administration, universities and schools. It is also possible that *sharing economy* solutions related to two-wheeled vehicles, which are less developed in Silesia Metropolis, have an impact in this respect.

The structure of two-wheeled vehicles (Fig. 14) is dominated by traditional bike classic scooters and electric scooters. Probably some of these devices are not used directly by the representatives of the creative class, but also by their family members (especially children). In the case of direct use, the respondents most frequently mentioned traditional bike, and the largest percentage of respondents declared that they

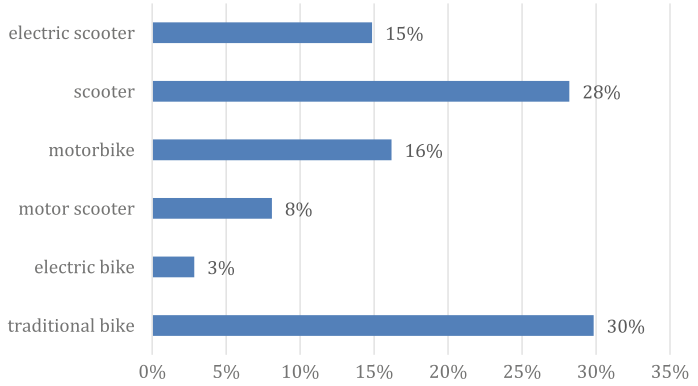

Fig. 14 Structure of two-wheeled vehicles owned by the respondents

normally used it less often than once a week—which indicates the mainly recreational use of bikes.

The respondents were also asked to prepare a travel diary for the latest working day, excluding Mondays and Fridays. Based on the presented photograph of the working day, the journeys made by the respondents can be very well parameterised and their main transport behaviours can be distinguished. It was adopted that a journey is every time connected with specific motivation, which results from the secondary character of transport needs. On the other hand, each journey consists of specific rides, or more precisely speaking, movements. Movements may result from the journey complexity, e.g. transfers, changes of the transport mode, etc.

According to Table 8, the biggest number of journeys per day was executed on the average by people working in Silesia Metropolis, whereas the biggest number of movements were made by people working in Warsaw. The journey model (Fig. 15)

Table 8 Number of journeys made by the respondents (photograph of the working day)

Data range	Number of movements per day	Number of journeys per day	Average number of movements per day	Average number of journeys per day
Overall	1212	1044	2.69	2.32
Warsaw	445	351	2.97	2.34
Tricity	371	326	2.47	2.17
Silesia metropolis	396	367	2.64	2.45

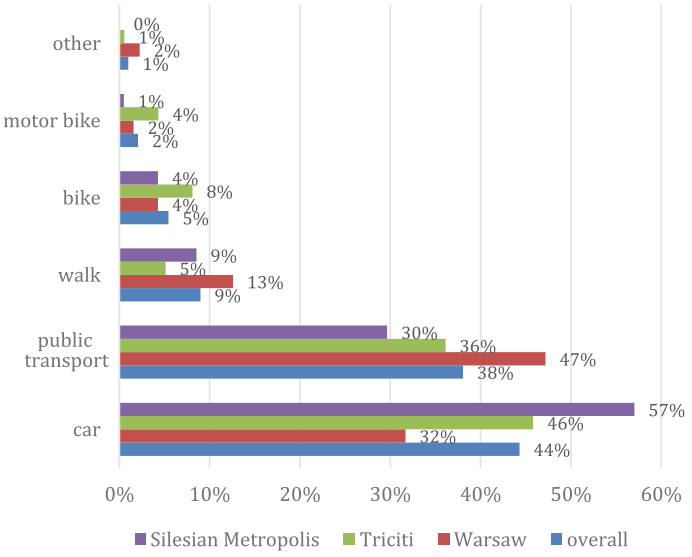

Fig. 15 Journey modal split of the creative class

Table 9 Distance of journeys made by the respondents

Data range	Total distance travelled per day (km)	Average travel distance (km)	Average daily distance of the respondent (km)
Overall	12,109	11.60	26.91
Warsaw	3345	9.53	22.30
Tricity	3711	11.38	24.74
Silesia metropolis	5053	13.77	33.69

looked very similar every time, regardless of the area. Due to the fact that adult working people were examined, the basic motivation pattern took the following form: home—work—home. On the return from work, there were sometimes additional motivations related to: micro shopping, shopping in shopping centres or leisure and entertainment. Based on the obtained data, the journeys made were parameterised according to the distance travelled (Table 9). The results showed that the longest journeys were definitely made by representatives of the creative class from Silesia Metropolis, whereas the shortest distance of movements was recorded in Warsaw.

Based on the results, the modal division of respondent journeys was prepared, taking into account the mode of movement used. Overall, the car dominated, the second position went to public transport, whereas the third position went to pedestrian movement and the fourth to the bike. The obtained results were different from one other in specific locations, and the advantage of public transport in fulfilling transport needs of the creative class was particularly visible in Warsaw. It is also worth emphasizing the unfavourable structure of division of tasks in Silesia Metropolis, with clear domination of individual transport and the lowest use of public transport.

The respondents were asked to choose the key postulate that guides them in selecting the mode of transport, or more broadly speaking, the mode of travel (Table 10). Overall, the first place went to cost and the second one went to comfort, followed by travel time, directness and safety. A different hierarchy of transport postulates resulted from the research in Silesia Metropolis, where the most important factor was travel time.

Table 10 The most important factors influencing the choice of movement mode according to the respondents

Data range	Travel time (%)	Comfort (%)	Cost (%)	Directness of travel (%)	Safety (%)	Other (%)
Overall	22.4	26.9	28.4	18.0	2.4	1.8
Warsaw	22.7	24.0	38.0	11.3	2.7	1.3
Tricity	5.3	30.7	37.3	22.0	4.7	0.0
Silesia metropolis	39.3	26.0	10.0	20.7	0.0	4.0

The following question concerned what would make the respondent use public transport instead of passenger car (Table 11). The largest percentage of respondents indicated that the reduction of public transport ticket prices would be the encouraging factor. The following among the most frequently indicated answers concerned the physical improvement of transport offer by: increase of transport frequency, development of network of connections and correction of the layout of transport stops.

Another group of questions concerned the possibility of increasing the share of the bike in fulfilling the transport needs of inhabitants. Based on the analysis of the data from Table 16, it may be noticed that more emphasis is placed on the comfort of using the bike in commuting to work. In Warsaw and Tricity, the expectations regarding bike routes have already been partly fulfilled. The problem of the lack of bike paths dominates in the Silesian Metropolitan Union area, which results e.g. from a huge dispersal and lack of integration of particular parts of the network of bike paths in the whole metropolis system. An increasing emphasis from the respondents is placed on the comfort of bike use in commuting to work, and overall, as many as 26.3% respondents indicated that the possibility to leave the bike in a safe place of travel destination was most important (Table 12).

Bike is a mode of transport whose use is undoubtedly affected by the atmospheric conditions. The results presented in Table 13 indicate that regardless of the weather conditions, bike is overall used in daily journeys by 6.8% of respondents. Tricity clearly stands out in this aspect, with the index exceeding 12%. However, it does not change the fact that the use of bike as the basic mode of transport is strictly dependent on the weather conditions, and on the average, 71.7% of the respondents use the bike only in the case of good weather.

Another group of results presents the feelings and intentions of the respondents concerning the use of passenger cars. The goal in this case was to identify the potential of changes from combustion cars to low-carbon or zero-emission vehicles. According to the data from Table 14, the respondents are definitely not going to replace their combustion car with an electric or hybrid car. The results show that the respondents are very sceptical about the problem of purchasing low-carbon vehicles. While particularly low interest is shown in the purchase of electric car, the respondents are more enthusiastic about hybrid vehicles, but mainly about their classic version. The respondents are most likely concerned about:

- high cost of purchasing electric vehicles,
- concerns regarding the evolution of operating costs in a longer time perspective,
- insufficient charging infrastructure.

Positive motivations for the replacement of combustion vehicle with a hybrid or electric car are focused on two issues: lower operating costs and better environmental effect. In the case of Warsaw, ecological motivations are more frequently expressed than the economic ones. (Table 15)

The respondents were asked to refer to the proposals of different variants of restricting passenger car traffic in city centres. To each of the presented statements, the respondents could answer based on five-point Likert scale, from “I definitely

Table 11 Factors encouraging the withdrawal from individual transport in favour of public transport according to the respondents

Data range	Ticket price reduction (%)	Higher transport frequency	Building P&R parks (%)	More convenient location of transport stops	Increasing comfort (%)	Development of network of connections (%)	Building transfer nodes (%)	Other (%)	Nothing will convince me (%)
Overall	22.9	19.0	8.2	11.0	12.5	15.8	7.1	1.4	2.1
Warsaw	25.4	18.8	6.9	12.2	12.4	15.2	8.1	0.3	0.8
Tricity	13.6	14.6	13.9	15.2	17.4	14.2	8.5	0.0	2.5
Silesia metropolis	28.9	23.6	4.3	5.6	7.8	18.0	4.3	4.0	3.4

Table 12 Identification of the main factors encouraging the respondents to make bike journeys on a daily basis

Data range	Roofed parking facility (%)	Availability of bike paths (%)	Availability of B&R parks (%)	Possibility to leave the bike in a safe place in the destination area (%)	Other (%)	Nothing will convince me (%)
Overall	12.4	23.4	20.2	26.3	0.8	16.8
Warsaw	15.2	18.2	21.2	26.9	1.5	17.0
Tricity	14.7	20.2	26.0	29.8	0.8	8.5
Silesia metropolis	6.6	33.2	12.4	21.7	0.0	26.1

Table 13 Use of bike by respondents depending on the weather conditions

Data range	Regardless of the weather conditions, also in the winter (%)	Regardless of the weather conditions, except for the winter (%)	Only in the case of good weather (%)
Overall	6.8	21.5	71.7
Warsaw	3.6	27.5	68.8
Tricity	12.5	25.0	62.5
Silesia metropolis	3.9	10.9	85.2

Table 14 Plans of respondents concerning the replacement of combustion car with electric of hybrid car

Data range	I'm not going to replace the car (%)	Electric car (%)	Hybrid plug-in (%)	Hybrid (%)
Overall	70.8	4.9	7.2	17.1
Warsaw	69.7	7.6	5.5	17.2
Tricity	67.6	5.8	13.7	12.9
Silesia metropolis	75.0	1.4	2.7	20.9

Table 15 Structure of motivation for the purchase of electric/hybrid cars by the respondents

Data range	Expected financial support of the purchase (%)	Easier access to the city centre (%)	Lower operating costs (%)	Better environmental effect (%)
Overall	13.4	12.8	36.3	37.4
Warsaw	18.3	3.3	36.7	41.7
Tricity	9.4	28.1	35.9	26.6
Silesia metropolis	12.7	5.5	36.4	45.5

don't agree" to "I definitely agree". The results were aggregated in three types of attitudes to the recorded statements: positive, negative and lack of opinion. The results presented in Table 16 indicate that the representatives of the creative class are willing to accept restrictions in passenger car access to city centres. A necessary element to build the approval for such solutions is to offer something instead. The respondents were most positive about the solutions ensuring the possibility of quick access to the city centre by public transport and in the case of high availability of public transport. The responses indicate the reluctance of respondents to use modern solutions, e.g. sharing economy and e-mobility.

5 Summary

The development of sustainable urban mobility requires a change of transport behaviours of the inhabitants, which will lead to effective and environmentally-friendly functioning of cities. Representatives of the creative class are an important social group, which is by assumption characterised by open-mindedness, ecological awareness and progressive thinking. This group has a strong opinion-forming voice and is indicated as the driving factor behind the regional development. Due to this, the transport behaviours and postulates of the creative class became a research object for the authors of this chapter.

The main conclusions drawn from the conducted study are as follows:

1. Representatives of the creative class execute a high number of journeys, among which car transport dominates.
2. Cars with conventional engines dominate in the households.
3. Contrary to the original claim, the creative class pays attention to the cost-related aspect of particular solutions.
4. In the group of factors influencing the possibility to withdraw from individual transport, the belief in required development of public transport dominates, whereas the respondents are largely sceptical about modern solutions resulting from the implementation of e-mobility and sharing economy.
6. The creative class is environmentally conscious and notices the possibility to reduce the external costs of transport. It means that this class can be a significant actor in the development of sustainable mobility.
7. Bike transport has a large and unused potential to influence a change of transport behaviours.

On the average, representatives of the creative class execute approximately 2.32 journeys per working day. The detailed comparisons indicated that the index of daily number of journeys for the creative class is higher than the average number for all inhabitants in each metropolis. The distribution of transport tasks in the creative class is similar as in the specific locations. Outside Warsaw, passenger car dominates in the movements of the creative class. Car is present in a majority of the analysed households. A low percentage of alternative-powered vehicles, especially hybrid and

Table 16 Opinions of the respondents concerning the limitation of passenger car traffic in the city centres

Statement	Negative attitude (%)	No opinion (%)	Positive attitude (%)
Entrance of passenger cars to the city centre should be restricted (e.g. by introducing tolls, prohibition to enter during peak hours, etc.)	38.0	18.9	43.1
I accept the restriction of car access to the strict city centre if it is possible to travel shorter by public transport	24.2	20.9	54.9
I accept the restriction of car access to the strict city centre if the public transport price is low	24.9	24.2	50.9
I accept the restriction of car access to the strict city centre if the public transport is highly available (short walking distance to the public transport stop)	22.7	23.8	53.6
I accept the restriction of car access to the strict city centre if public transport ensures direct connection with the city centre	21.6	28.0	50.4
I accept the restriction of car access to the strict city centre if it is possible to travel by bike	28.9	32.9	38.2
I accept the restriction of car access to the strict city centre if car sharing—payable short-term car rental system, e.g. Traficar is developed (cars within this system can enter the city centre)	29.1	38.4	32.4
I accept the restriction of car access to the strict city centre if it is possible to travel by other modes of transport within a payable short-term car rental system (e.g. electric scooters)	33.3	28.4	38.2

electric vehicles, is noticeable. Additionally, a vast majority of the respondents are unwilling to replace combustion vehicles with low-emission vehicles. A significant factor preventing the replacement of vehicles is the high cost of purchase and uncertainty regarding the operating costs. The key barrier for the selection of electric or hybrid car as the next individual vehicle is the income barrier.

Car is the main method for fulfilling transport needs. Therefore, it may be concluded that the indicated key postulates related to the selection of the mode of transport are precisely applicable for the car. These are: travel comfort and cost. Travel time is the decisive factor behind the selection of the mode of transport in the case of Silesian Metropolis, comfort dominates in Tricity, whereas cost is the priority in Warsaw, followed by Tricity. While in the Upper Silesian Metropolis the cost is less important, in the case of Warsaw and Tricity it seems to be a more significant factor behind the selection of the mode of transport. This does not change the fact that far more than a half of the choices concern travel time and comfort, and since the dominating mode of transport is car, it may be recognised that it is precisely travel comfort and time that decide about the choice of car as the basic method for travelling in metropolises. Therefore, it may be concluded that the role of car in fulfilling mobility mainly results from the fact of shorter travel time and higher comfort offered by car.

A change of transport behaviours is very difficult. The respondents, when asked about the factors that would make them use public transport and withdraw from the use of cars, were sceptical about the restrictive instruments (limited parking time for vehicles in city centres, restriction in vehicle access to the city centre and high parking fees). When asked what would make them resign from individual transport and change to public transport in daily journeys, the respondents indicated the key importance of reduction of ticket prices, whereas the quality of transport understood as ensuring a higher frequency of public transport, as well as its comfort and availability, were stated much more frequently. There were noticeable differences between the metropolises resulting from the development status of public transport in such urban areas. In particular, higher significance in Silesia Metropolis was attached to price reduction and increase of availability. It is also worth noting the higher acceptance of respondents for the instruments which, although restricting the car access, are still related to positive actions, especially such as: short time, high availability and low public transport price. However, this does not apply to all positive tools—the respondents keep distance to the substitutive role of car sharing and sharing economy-based system of scooters.

The creative class notices the problem of ecology in their responses. Despite being sceptical about electromobility, they also appreciate the ecological benefits of electric car and lower operating costs, whereas they are more reserved about the transport policy instruments that would enable to subsidise the purchase of car and use it easier in the urban space.

Although the use of bike in daily journeys (based on the travel diary) is declared by 5% of respondents on the average, the occasional and mainly recreational use of bikes probably dominates, because only 6.8% of the respondents reported all-year bike activity, insensitive to weather changes, whereas over 70% of respondents use

the bike only in good weather. Among the barriers preventing the popularisation of transport function of bikes, the respondents mentioned the deficiencies in linear infrastructure and shortage of adequate parking lots in the destination areas.

The right to move is one of the fundamental citizen rights and freedoms. Due to this, it is very difficult to cause a change of transport behaviours. The research results indicate that the instruments for sustainable mobility based on innovations do not entirely meet the expectations. The largest potential for a change of behaviours still lies in the development of public transport offer and creation of good conditions for bike movements.

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