COMPARATIVE ANALYSIS OF MOBILITY PATTERNS
IN RUSSIA AND OTHER COUNTRIES

International comparative studies of mobility cultures, established in different cities across the world, offer useful analyses summarising trends and patterns described in national travel surveys and alike reports. The paper aims to give a general impression of the mobility patterns in Russian cities and abroad, touching upon such quantitative indicators of travel behaviour as the frequency of trips, average distance travelled, purpose of travel, modal split and commute time. The overview presented in the paper shows how Russian cities’ mobility model differentiates from those found in other parts of the world, including the USA, Europe and some Asian examples, in order to identify the right ‘role models’ with the closest indicators of travel behaviour.

Keywords: urban mobility, Russian cities, travel behaviour, mobility patterns, international comparison.

Introduction. Urban mobility is a matter of growing concern in all Russian cities. In Moscow hours-long traffic jams have become the norm as it ranks second in the world among the cities with the biggest traffic jams: drivers there spend an average of 91 hours per year in traffic jams, which is approximately 26% of all the driving time [1]. While the situation is particularly bad in such megacity as Moscow, these problems are not peculiar to Russian metropolises but increasingly develop in other large and medium-size Russian cities. Their residents are now facing the escalating urban transport challenges including traffic congestion, deteriorating public transport services, a growing number of traffic accidents and other. These local transport...
constraints make it more difficult to attract new investment and workers reducing the competitiveness of the fastest growing cities, which are meant to become the locomotives of the country's economic growth.

Meanwhile, the aforementioned mobility issues like increasing road congestion and the decline of public transport service are not unique to Russian cities but experienced in cities all over the world. In all cities the growth processes in car ownership and use are incipient as soon as private automobile become available and affordable by large masses of the population. So one way to predict further development directions, possible problems and ways out of them is by gaining insights from the experience of cities that are similar by size, geographical position or spatial structure. Yet borrowing of ideas that proved to be effective elsewhere should be done with great caution. There is a need for best-case practices that are directly applicable and relevant to the problems of Russian cities. It is, therefore, important to determine the possible 'example models' that possess mobility patterns that most closely correspond to the ones found in Russian cities. The comparative quantitative analysis of the travel behaviour in Russia and other countries aims to provide a foundation for this.

*Comparative indicators and data sources.* International comparative studies of travel behaviour offer useful analyses summarising travel patterns resulting from surveys and aggregate national data but the results must be interpreted cautiously taking into account all the inconsistencies among country surveys in their timing, variable definitions, and survey methodology. This overview, therefore, is aimed only at giving a general idea of how Russian cities' mobility model differentiates from those found in other parts of the world and identifying 'role models' with the closest indicators of transport behaviour. The countries in the review below include, firstly, North American ones, having the vast experience of implementing ‘car dependent cities’ paradigm, and, secondly, European ones, conducting the transport policy that has been strongly orientated towards maintaining and increasing the levels of public transport use in the city. In addition, the overview will touch on some Asian cities, for example, Singapore or Hong Kong, widely considered as transport policy success stories.

The choice of the indicators for the comparative evaluation is always limited by the data available. In Russian and many other post-socialist cities the data concerning the performance of urban transport systems and the travel behaviour of citizens is almost totally non-existent, especially data on specific cities. The openly published data that may be obtained from the Federal State
Statistic Office (Rosstat) is limited by the figures of public transport ridership and passenger turnover at the national level. Most city administrations are also not in possession of up-to-date and reliable information on travel patterns established in their cities, not to mention historical data enabling the trend analysis. The above described data gap was partially eliminated by the recent research of the Higher School of Economics (HSE).

Thus, the data for Russia comes, firstly, from the Institute for Transport Economics and Transport Policy Studies of Higher School of Economics (HSE) – the first comprehensive household travel behaviour survey in Russia conducted in 2014. The empirical base of the study is based on a random sample, representing the population of the Russian Federation, the total number of respondents amounted to 8028 people. According to authors this unparalleled survey makes a valuable contribution in the developing mobility-related research in Russia and "the results of the survey enable the comparison of mobility patterns in Russian cities and abroad" [2, p. 259]. Additionally, the secondary data of Comprehensive monitoring of living conditions 2016 (CMLC 2016) by the Federal State Statistics Service (Rosstat) concerning particular travel behaviour indicators of Russian population was used [3]. CMLC sample covers 60 thousand households throughout the whole country.

International counterparts for comparative analysis include the United States of America, countries of the European Union and separately the United Kingdom. Both the US and the UK have a long history of transportation research and today these countries possess a rich array of both up-to-date and historical data, which enables analysis of the dynamics of change in travel patterns (what the researchers are almost completely deprived of in Russia). Some countries of the European Union also have a long tradition of conducting National travel surveys (NTS) but the availability and type of national travel data is quite varied across Europe. Due to the lack of the truly comprehensive travel survey on the pan-European level, EU countries should look for the ways to standardise or at least harmonise both data collection and data preparation.

Thus, the EU data comes from the two sources: EMTA Barometer of public transport in the European metropolitan areas 2016 [4] and the Eurostat metadata (Perception survey results (urb_percep)) collected for the perception survey on the quality of life in 79 European cities during 2015 [5]. One of the sources of the UK data is the National Travel Survey 2017 – a household survey of personal travel by residents of England travelling within Great Britain. The NTS is a part of a continuous survey that began in 1988 and is based on the data collected via interviews and a one week travel diary [6]. Another data source is the report showing statistical trends in the British
transport sector - Transport Statistics Great Britain: 2017 ([7]. The US data originates mainly from the National Household Travel Survey 2017 [8]. This report is a part of the survey series conducted since 1969 (1969, 1977, 1983, 1990, and 1995 NPTS and the 2001 NHTS, 2009 NHTS, and 2017 NHTS) and includes detailed information on daily travel by all modes of transportation and for all purposes. Additionally, such data set as the 2014 American Community Survey (ACS) for the commuting habits information was used [9].

The final data source that provided useful information on the certain indicators of Asian cities (in the absence of other reliable sources) was the UITP (Union Internationale des Transports Publics) database – The Mobility in Cities Database 2015 (MCD) collected for 60 metropolitan areas worldwide for the year 2012 [10].

The central category in all the mobility studies is the concept of trip. It is the most universal measure of personal travel and serves as a basic unit in most current surveys. A trip is defined as a one-way course of travel with a single main purpose. It may be performed in any mode of transportation including walking, and must be used when comparing travel by various modes (e.g., private vehicles, public transportation, walking, etc.). Thus, key indicators of travel patterns, that are frequently used in surveys and that will be used to compare travel behaviour in Russia and other countries, include:

- daily person trips;
- average distance or person miles/kilometres of travel (PMT/PKT);
- purpose of travel;
- modal split;
- commute time.

**Daily person trips.** For Russia in general the average number of trips was determined at the level of 3,1 trips, as for the largest cities the figure is slightly higher – around 3,2 trips per person per day with 2,4 trips made by transport (see Fig. 1, a). In the UK people made 975 trips on average in 2017, which means 2,7 trips per person per day [6], the number of trips excluding the short ones is around 2,1 per day. The EU cities daily person trips number constitutes for 2,8 trips [4]. The highest trip rate per person is in the USA – 3,4 trips [8].

The USA and the UK national travel survey also allow to see the dynamics of change in travel patterns: both countries show a downward trend in trip rates per capita since 1990 (see Fig. 1, b). Although understanding genuine reasons for these trends is difficult, factors that contribute to the trend, may include changing demographic patterns, such as aging of population characteristic of both the societies, or technological advances.
enabling the substitution of physical travel via teleworking and distance learning, online shopping, social media networking, etc.

According to the UITP database, Russian cities' average value for the number of daily trips is also sitting somewhere between US auto-dependant cities and Asian cities with highly developed transit, on the level of European cities (see Fig. 2). This database provides one more indicator that might be of interest to compare – public transport passenger-kilometres per inhabitant in selected world cities. In the absense of such data on specific Russian cities, the national average value for public transport passenger turnover (excluding non-urban population) may be calculated. According to the annual report Transport in Russia 2018 by the Federal State Statistic Office (Rosstat) urban public transport passenger turnover constituted for 142 billion passenger-kilometres, while the total urban population was 109 million people [11]. So according to this indicator, Russian cities with 1300 PKM per inhabitant are between American and European ones, disparately lower than Asian Singapore, Tokyo or Hong Kong. For Russian cities achieving the levels of public transport use, characteristic of Asian cities, does not seem possible. Population densities that appear to be extreme for Russian realities along with some collectivistic cultural patterns contribute to mass use of public transport even by middle and high-income population of the developed Asian cities.
Average annual/daily distance. An alternative indicator of the mobility volume is the average distance travelled per person or Person Miles/Kilometres of Travel (PMT/PKT). Data from the national travel surveys of the UK and the US allows to compare the volume of travel there with the same indicator for Russia. According to the HSE survey the average distance travelled by Russian citizens per day was estimated with the help of travel diaries since most respondents find it difficult to give an accurate figure when completing questionnaires. The analysis of the diaries showed that the average distance travelled was 20 km per day [2]. In the UK and the USA the corresponding figures were approximately 29 and 58 km per day (both countries use miles as distance units), which means that Russian citizens' mobility is generally lower than that of the British and especially Americans.

As for the dynamics of changes in this indicator, in the UK the average of 6,580 miles (approximately 10,590 km) travelled in 2017 was 9% lower than the highest recorded in 2003 [6]. In the US there is also a downward trend, first noted in 2001 and continuing then up to the present. The peak value of 14,115 miles (approximately 22,710 km) was denoted in 1995, by 2017 the figure has decreased to 13,166 miles (approximately 21,183 km) [8]. For Russia there are also some data allowing to see the changes in distance travelled since 1970, but, unfortunately, only up to 2009 (see Fig. 3).
According to these data annual distance travelled per capita in Russia was 6,300 km – 17,4 km per day. Moreover, the data show that overall population mobility in Russia grew against the backdrop of increasing use of private cars and reducing passenger traffic on public transport [12].

Another interesting observation made by Mikhail Blinkin [12, p. 49] is that the population in Russia is currently divided into two polar groups: smaller one (around 15 %) is highly mobile with mobility indicators close to American figures, and the other one, which constitutes a major part of the population, demonstrates travel behaviour with mobility volumes "at the level of the era of horse-drawn transport" (see Fig. 4).
Trip purpose. Personal travel is often dominated by frequent, repetitive patterns, of which most obvious is daily commuting to work. The US and the UK have very much similar distribution of trips purposes with around 19% of trips for commuting/business or other work-related activities (see Fig. 5). Other common reasons for travel are for shopping, recreational activities and study. In Russia the distribution is a bit different as the most popular reason for travel is personal and family issues, comprising 31% of all trips. Work-related trips also have significantly higher proportion, being second most popular reason for travel in Russia. A surprisingly low share is taken by education purposes, the number of trips for shopping in Russia is between those values in the UK and the US. The authors of the Russian survey also have not noticed any considerable difference in the distribution of trip purposes with relation to the size of a city.

Fig. 5. Distribution of trips by purpose. Created by author based on [2] (Russia) and the NTS data [6, 8] (USA, UK)

Рис. 5. Распределение перемещений по целям. Создано автором на основе [2] (Россия) и данных национальных исследований транспортного поведения населения [6, 8] (США, Великобритания)

Average commute time by region/state. Another primary measure of travel patterns is the average time to work (one or both ways). The maps from Fig. 6 show that overall situation is more preferable in Russia than in the UK and more or less resembles that of the USA. Both Russia and the USA have regions with different levels of development and correspondingly varying intensity of traffic, which affects commuting times, in the UK the commute time rates are about the same across the country, except, of course, for the capital. People working in megacities such as Moscow, London and New York always have the longest average commute.
Among Russian regions extreme values of over 50 min are observed only in Moscow – 76,1 min, St. Petersburg – 74,7 min, Moscow oblast – 64,6 min, Leningrad oblast – 51,8 min, and Novosibirsk oblast – 50,8 min (see Fig. 7).
Fig. 7. Commuting time (both ways) by region, min in the European part of Russia. Created by author based on CMLC 2016 [3]

Рис. 7. Время в пути до работы и обратно в минутах по регионам европейской части России. Создано автором на основе данных Комплексного обследования условий жизни населения 2016 [3]

The data has high amounts of variability within each state or region. It is, therefore, reasonable to compare commute times across the cities of more or less equal size. The graph from Fig. 8 shows that American cities have shorter commutes in comparison with Russian and European ones, which, however, does not indicate the possession of more efficient transport systems. On average in the US, the commute time by public transport is twice as high as travel time to work by private car (44 min by public transport versus 24 min by car), while the time by car is much closer to the national average
by all modes [9]. Such disparity is the result of a strong bias towards the use of private automobiles as compared to other modes of transport, as is also evidenced by the data on modal split considered below.

Mode share. Fig. 9–11 present the distribution of transport modes either 'used as the principal means of going to work' in case of the EU and the US or 'used regularly' in case of Russia. For the EU and Russian cities the sum of the shares exceeds 100 % as respondents were given the opportunity to mention more than one means of transport.

The figures show that in all Russian cities and in most European ones less than a half of the respondents use cars as their principal means, while in American cities, except for New York, San Francisco and Philadelphia, cars dominate greatly in daily commute with three quarters of the citizens choosing this mode of transport. The mode share of both public transport and walking in the US cities remains marginal in comparison to the European and Russian cities.
Fig. 9. Distribution of the principal means of going to work, EU capital cities. Source [13]

Рис. 9. Основные способы добираться до работы в столицах ЕС. Источник [13]

Fig. 10. Distribution of the regularly used means of transport, Russian cities. Created by author based on the CMLC 2016 [3]

Рис. 10. Регулярно используемые виды транспорта (по городам России). Создано автором на основе данных Комплексного обследования условий жизни населения 2016 года [3]
The relatively low share of car usage in most European cities is explained by the wide range of public transport services generally on offer providing a feasible alternative to cars: good service provision and quality infrastructure allow public transport to be a lifestyle choice. In Russia, though, the share of public transport is even higher, despite the much lower level of service and comfort. During the Soviet period transport demand was almost solely met by public transport, its use was forced for functional and ideological reasons. Today, in the absence of alternatives for a large part of population, public transport ridership remains relatively high in spite of the overall degradation of infrastructure and vehicle stock. Noteworthy, that the deterioration of public transport system affects largely low-income populations in Russian cities, who often reside at the urban periphery and primarily rely on public transport for access to jobs and services.

Walking to work was generally the third most common mode of transport in European cities. Currently walking, together with cycling, make up an average of 20 per cent of daily trips in most European countries while in such countries as the US, Canada and Australia the proportion of non-motorized trips is much lower [14]. Bicycle usage is especially high in Copenhagen and Amsterdam, where it is a key means of movement, and also Berlin – cities that are well-known for their policies in favour of non-motorised and public transport introduced since the mid-1970s. In Russia, as well as in the US, cycling is mostly for recreational and fitness purposes.
**Conclusion.** A well-established view of the two broad types of cities with a rough assignment of all American cities to auto-dependent and European cities to transit-oriented ones, has been, by and large, confirmed by the above overview. In addition to these two types there are also such a group of cities as Singapore, Hong Kong or Tokyo, which are sometimes claimed to be the right example model for Russian cities [15]. However, the data show that the Russian cities' figures for public transport use and mobility as a whole are far below those observed in the transit Asian cities. To date the patterns of urban mobility characteristic of Russian cities most closely resemble those of the European counterparts.

'European model', with such attributes as focus on non-motorized views and developed public transport system, is now recognised as the effective way to reach sustainable and effective mobility. Even American cities, together with Canadian and Australian ones, that have been going their own 'auto-oriented' way for decades, have started introducing elements of 'European-style' mobility. Some of the most successful European cities have shown that it is possible to decouple urban traffic growth from economic growth and reach the decrease in car modal share. Their transport systems not just put less pressure on the road network thus helping to reduce congestion and air pollution, but at the same time improve transport efficiency and urban quality of life. Thus, Western European approach to mobility issues present the most optimal overall example, that Russian cities should aim to follow.

**References**

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Сравнительные исследования особенностей транспортной культуры, характерной для разных городов мира, обычно основываются на анализе результатов национальных опросов о транспортном поведении индивидов и аналогичных им исследований. В России до недавнего времени не проводились подобные опросы, а данные о работе городских транспортных систем и транспортном поведении населения, публикуемые Федеральной службой государственной статистики, ограничивались показателями пассажирооборота и пассажирообращений в целом по стране. Этот пробел в данных был частично устранен исследованием Высшей школы экономики, проведенным в 2014 году на основе комплексного опроса домохозяйств в различных регионах России. Кроме того, в целях проведенного сравнительного анализа использовались данные Комплексного обследования условий жизни населения 2016 года.

Проведенный сравнительный анализ позволяет получить общее представление об особенностях моделей транспортного поведения в российских городах и за рубежом с использованием таких количественных показателей, как частота перемещений (подвижность), средняя преодолеваемая дистанция, цели перемещений, время в пути до работы и обратно и распределение по способам перемещения.

Обзор, представленный в статье, показывает, как российские города с точки зрения сложившейся модели городской мобильности отличаются от городов в других частях мира, включая США, Европу и Азию. Изученные данные позволяют сделать вывод, что на сегодняшний день закономерности городской мобильности, характерные для российских городов, наиболее близки к европейским аналогам. Именно европейские города, как имеющие наиболее близкие к российским реалиям показатели транспортного поведения населения, могут стать образцом для подражания в области транспортной политики для городов России.

Ключевые слова: городской транспорт, транспортное поведение, модель городской мобильности, крупнейшие города, международное сравнение.

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