Introduction

There are two hypotheses for travel behavior analysis:

1) Citizens are free to choose place of residence, travel mode, and route. Consequently, travel demand is influenced by value of time and generalized cost of travel. However, travel behavior cannot be reduced to two factors and has a very complicated structure.

2) City government must be familiar with traffic patterns of citizens within the city limits in order to manage infrastructure projects and travel demand. Arranging periodical surveys of traffic flow and patterns allows companies to help improving their strategies.

These hypotheses seem quite feasible for cities with developed labor and real estate markets and a longstanding tradition of local democracy.

By 1917, Russian cities were just beginning to establish this type of administration. The level of population mobility was low, and a number of trips limited. Joseph Brodskiy, a Nobel laureate in literature reflected on this level of mobility in his poem *The Classical Ballet*: "A small plot gave you birth, the nest you lived and died in".[1] In 1900, a Russian engineer Heinrich Girshson made a comparative study of a number of trips per citizen in various cities across the world. According to him, in 1893, there were 290 trips per citizen in New York, 228 in Chicago, 128 in Brookline, 172 in Boston, 145 in London, 140 in Berlin, 100 in Paris, 87 in Budapest, 70 in Vienna, 60 in Saint-Petersburg, and 50 in Moscow" (Girshson, 1900: 540).

The quality of public transportation in pre-revolutionary Russia did not encourage people to travel. One of the first Russian urbanists wrote: "I blanch at the prospect of using the Moscow public transport. In Berlin, however, it is a pleasure" (Ozerov, 1906).

A bit later, a Russian engineer Greg Dubelir improved the thesis of Ozerov's book regarding the need for travel behavior analysis (Dubelir, 1910). Dubelir visited USA and was inspired by the mass development of

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[1] Joseph Brodsky's "The classical ballet…" is dedicated to Mikhail Baryshnikov

private automobile ownership. He linked the ability to travel faster and farther with the oncoming century of motorization. Dubelir believed that the tendency of "traffic volumes increasing due to private automobile use" should be a prime factor for consideration in the contemporary town planning.

Between 1917 and 1932, planning issues were discussed by some of the most talented engineers in USSR. They believed that the socialist idea was worth combining with rational and humanist approach to town planning. For example, Abram Zil'bertal emphasized that transportation planning issues cannot be reduced to a mathematical problem. The solution is dependent on the society's demand for comfort as well as on the value of time (Zilbertal, 1932). Another Russian engineer, Georgiy Sheleykhovskiy, believed that cities belong to their residents. Humans are different from "inhabitants of a wild beast show" because they are free to live and travel anywhere. When the principle of free and native settlement is disrupted, a city becomes uncomfortable (Sheleykhovskiy, 1946). However, the subsequent 50 years had shown that living in comfort was not necessarily an aspect to be reckoned with when decisions had to be made.

Nevertheless, while sociological surveys were allowed in the mid 1960's (Firsov, 2012), travel surveys have been conducted very rarely. One Estonian researcher did complete such a survey in the 1980's due to liberalization of the communist regime and relatively high level of motorization in the republic (Arrak, 1982).

The methodology of transportation planning in USSR (see Ch.8) has been different from the Western approach. Low motorization level along with the absence of housing market and labor market compelled people to spend most of their lives in the same place. As a result, travel behavior was influenced by public transportation supply. Moreover, urban planning suggests that industrial areas and residential districts should be built in close proximity. As a result, the commute options available to the working class were limited to either boarding a tram or walking. Zilbertal wrote that the only alternative available to a tram passenger were his legs (Zilbertal, 1932).

As cities grew bigger, the interest in transportation surveys increased. In the 1960s-1980s, cities in advanced countries tried to manage public transport in an effective way. The methodology of transportation studies developed accordingly to the new challenges.

The approach to transportation planning in USSR was based on two principles. Firstly, it was the planning process supported by monitoring surveys of ridership and passenger turnover. Ridership statistics was the central indicator used by land electric transport planners till 1992. Passenger turnover was the central category for city bus companies. This information was necessary not only for transportation planning but also for transportation industry and financial support.

The average length of a trip is the data required for both indicators. For trolleybus and tram lines, these numbers were constant. New lines were rarely built, so the trip distance was a fixed value. In contrast, bus lines developed quickly to emulate urbanization process.

However, the statistical committee concentrated on collecting data on ridership while average distances were not required to be documented. As a result, the methodology of transportation studies developed accordingly to applied tasks.

The second principle was compiling a trip matrix, which became necessary due to the growing sophistication of travel behavior. In a big city, destination points could vary, as could departure points in residential areas. The theoretical groundwork of the Soviet transportation studies was based on technocratic vision and suggested quantitative methods and statistical analysis. Travel behavior analysis was not to be conducted at an individual level. All trips were analyzed as depersonalized flows of passengers, and its fluctuation would premeditate either adding or deleting one train route or another.

The approach to travel behavior analysis in USSR was reduced to the so-called "route-mobility". A number of trips per specified duration served as a main point of reference for transportation planners and officials. It is important to emphasize that human mobility was tantamount to the intensity of public transport usage. Consequently, field methods propose

different approaches: "(1) active continuous control, (2) automatic occupancy control, (3) visual estimation of the number of passengers, (4) survey methods" (Efremov, et.al., 1980: 395). The last one is also subdivided into the questionnaire, table, and talon[2]-based methods of counting. Of those, the questionnaire-based survey is the most difficult to implement. "This kind of surveys pursues the goal of evaluating the performance of public transportation service, pedestrian activities, time budgeting, and so on. Travel diaries allow collecting info on travel frequency, travel modes, and other characteristics. The results can be used in general layout development, public transportation administration, and transportation planning" (Lobanov, 1990: 33). All the Soviet sources emphasize that proper application of survey methods are extremely important. However, sociological sources that might help address methodological problems were neglected. Technical austerity provokes adoption of a statistical apparatus rather than sociological. So, the overall situation with the implementation of methodology seems quite similar to the respective experience in the developed countries abroad.

In the recent history of Russia, the sociologically oriented travel surveys have never been conducted. The legacy of USSR, the statistics-based approach is being preserved. Many of the specialists in the field have only basic understanding of the scale and structure of human mobility in Russia. As a result, there is no scientific validation of the forces assumed to drive it. Operational data like reasons for travel, travel modes, distances, travel duration etc. have not been collected, either. It should be mentioned that travel surveys were occasionally conducted on a citywide scale. However, the results of such surveys were concealed from public, and researchers are not allowed to share the figures and methodology in academic literature.

The decision to conduct a travel behavior survey would not usually be based on an intention to solve a specific problem. The establishment of priorities in the transportation policy in Russia is not guided by rational calculation. In fact, this process may be suggested as another promising

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[2] Talon-based method is used for ridership distribution survey. Passengers take a talon on stop (or station) and drop it off in destination point.

topic for research.

In the case of a travel survey, a team of professional sociologists focus on the lack of data and methodological gaps. We tried to shift the attention from intensity of vehicle usage to human mobility and formulate some of the circumstantial parameters.

Methodology

The preparation of the first nationwide travel survey in Russia included the suggestion to conduct a critical review of the methods used abroad and subsequently adapt their main components to the local specifics.

A number of interviews had been conducted prior to the initial formulation of a questionnaire. The questionnaire was revised 5 times before the final version was approved. All stages suggested testing procedures on three randomly selected respondents. Nevertheless, while the diary method is quite popular in foreign countries, it is hard to implement in Russia. The common practice is asking the respondent to fill in the blank spaces in the diary after the general questions have been posed by an interviewer. However, a 600-respondents pilot survey shows that only 10% of all the respondents were eager to complete the travel diary. The only way to advance was to incorporate the "yesterday travel" section into the main questionnaire. As a result, the final version of the questionnaire comprised 8 blocks and 57 questions. Despite a money reward offered for completing a 4-days travel diary, only 10% of all the respondents who took part in the final survey actually completed the travel diary via the Internet.

The GPS technology can provide interesting outcomes, and it was necessary to find a suitable opportunity to use it. A test group in Moscow used to track their trips with a special application on a smartphone for a couple of days. However, the results were extremely inaccurate, and testers complained at the interface and battery demand, so the idea was rejected.

Eventually, the CATI (Computer Assisted Telephone Interview) technology was selected as the main instrument of surveying. The probability stratified sample included mobile and landline phones at a ratio of 75% to 25% respectively. 8028 respondents completed the questionnaire,

and 1041 respondent filled the travel diary. However, the sample of the internet survey was not random. The survey was conducted in September 2014. AAPOR's indexes are shown in Table 1 and demonstrate good results in comparison to the country-wide surveys.

Table 1. Response rates of the first nationwide travel survey

COOP1	RR3	REF2	CON2
37,3	16,2	23,7	43,6

General observations

The first question in the survey suggests identifying three "types" of mobility in the long-term perspective. The difference between them is based on the characteristics of occupation and leisure activities. The first type is called the "sedentarists" group. It refers to the people who rarely leave their place of residence except on occasions such as a vacation. The second group is called "migrants" and includes active people who frequently go on business trips, spend weekends in the countryside, or work in the transportation sector. Finally, the third type is named "rotation workers". This term refers to the seasonal workers or those who spend a lot of time in other cities or even countries. Figure 1 shows the distribution of these three groups among the respondents.

Figure 1. The distribution by long-term mobility type

Rotation workers 7%
Migrants 30%
Sedentarists 62%
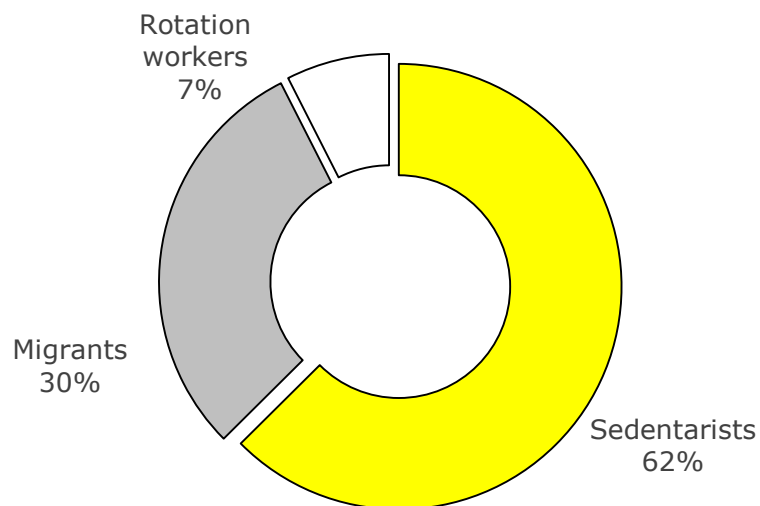
      The greatest share of the respondents identified themselves as "sedentarists". This is a characteristic feature of human mobility in Russia: people are not interested to move frequently and far away. According to the research conducted for "Strategy-2020"[3], the travel behavior of 20% of Russians shows the same figures as the average in advanced countries. 10% have no access to transportation at all. Moreover, 81% of the population never leaves the Russian Federation (Strategy, 2013: 46).

      This case of low mobility seems true for short-term and long-term perspectives alike. According to the travel survey, the share of the respondents who prefer to spend their free time outside their home is similar to the opposite – 45% in both cases. Less than one third (27%) of the respondents changed their place of residence in the 5 years preceding the survey. Furthermore, half of the people who changed the place of residence did not feel any changes in their personal travel behavior. The distribution of the three mobility types among the communities does not show any significant variations except in millionaire cities and rural areas. The millionaire cities have the smallest share in the "sedentarist" group – 54%, while 72% of people identifying with this group live in villages.

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[3] "Strategy 2020" is the concept for socio-economic development in the Russian Federation till 2020. The concept was developed by academics in 2010. It comprises 21 promising directions including transportation.

In the Soviet academic literature, a lot of authors noted the correlation between the number of trips taken by public transportation in communities and the size of population. The relationship is quite simple: residents of big cities take more trips in comparison to people living in rural areas. The same result is shown by the travel survey, although the difference between the biggest and the smallest communities is minor.

Figure 2. Average number of trips by type of settlement
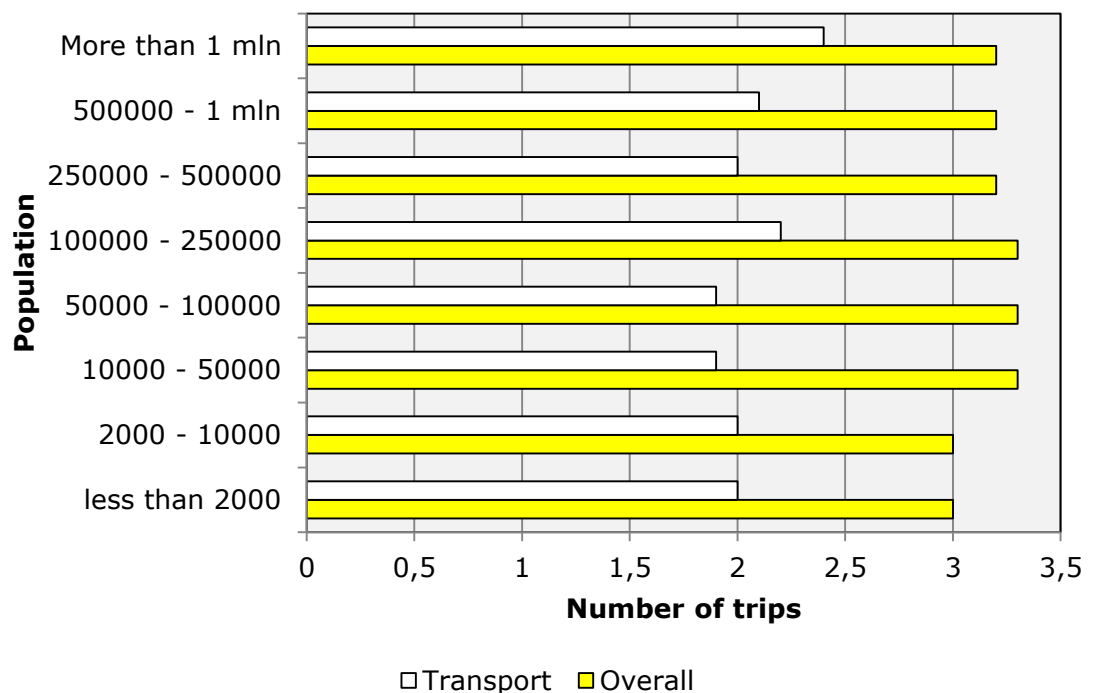
The average number of trips per day is 3.1. For the "migrants" group, it is 3.4, and for the "sedentarists", it is slightly smaller (3.0). The "rotation workers" occupy the middle position and take 3.1 trips per day.

The most popular reason for travel is "private and family issues," comprising 31% of all the responses. The second place is taken by work-related trips, including commuting – 29%.

Figure 3. Distribution of trips by purpose
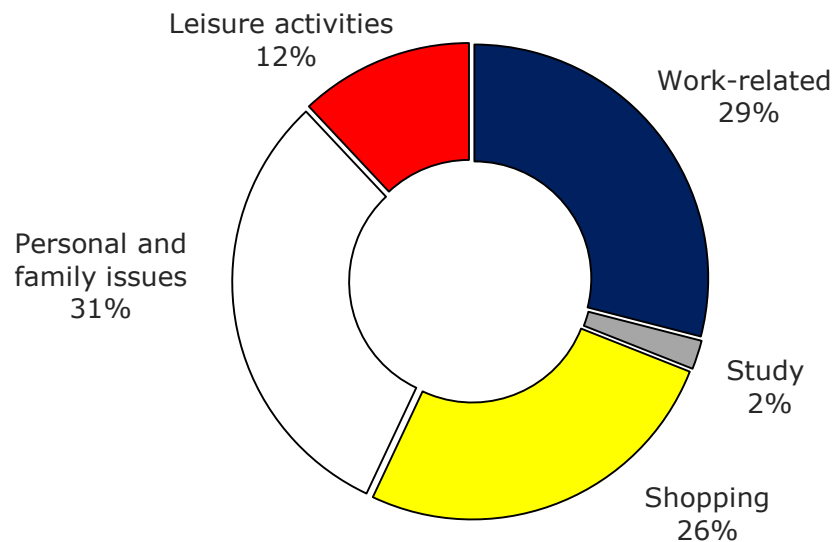
Likewise, there is no significant difference in the distribution of trips with relation to the size of a city. However, it seems like a fairly unstable interrelation between factors such as working, shopping, and personal and family issues, and it tends to change with time.

We assume that the travel behavior of the respondents could have been conditioned by the kind of activities at their destination point. These activities could have affected the choice of travel mode, route selection (if it involved alternatives) and time budgeting. The questionnaire included several questions regarding the route choice and the necessity to arrive somewhere right on time. 90% of the respondents had to get to work at the specific time. It is quite clear that 90% should have also used the same route to get to it. The situation is the same for those commuting to their place of study. Other reasons for travel vary by time and route, and those appear constant for about 10% of the respondents.

Private and public transport

73% of all public transportation trips are made by various kinds of buses. *Marshrutka* means a privately-owned minibus (fewer than 20 passengers) which operates on a preset route and sometimes runs on schedule. Revenue is collected by the driver. They became very popular since USSR fell apart and local governments denied financial support for

"classic" public transportation. For a lot of average-scale cities, "marshrutka" serves as a main mode of public transportation.

In spite of the fact that 77% of the respondents reported living at a 10-minute walk from a bus stop, the use of public transportation decreases year after year. The Soviet urban planning approach included development strategies that were transit oriented to an outstanding degree. However, it did little to improve the performance of Russian public transportation. Moreover, no public transportation at all is referred to in 8% of the responses. The largest group of these respondents (65%) lives in the countryside.

Figure 5. Ridership distribution by public transport mode and availability of infrastructure.
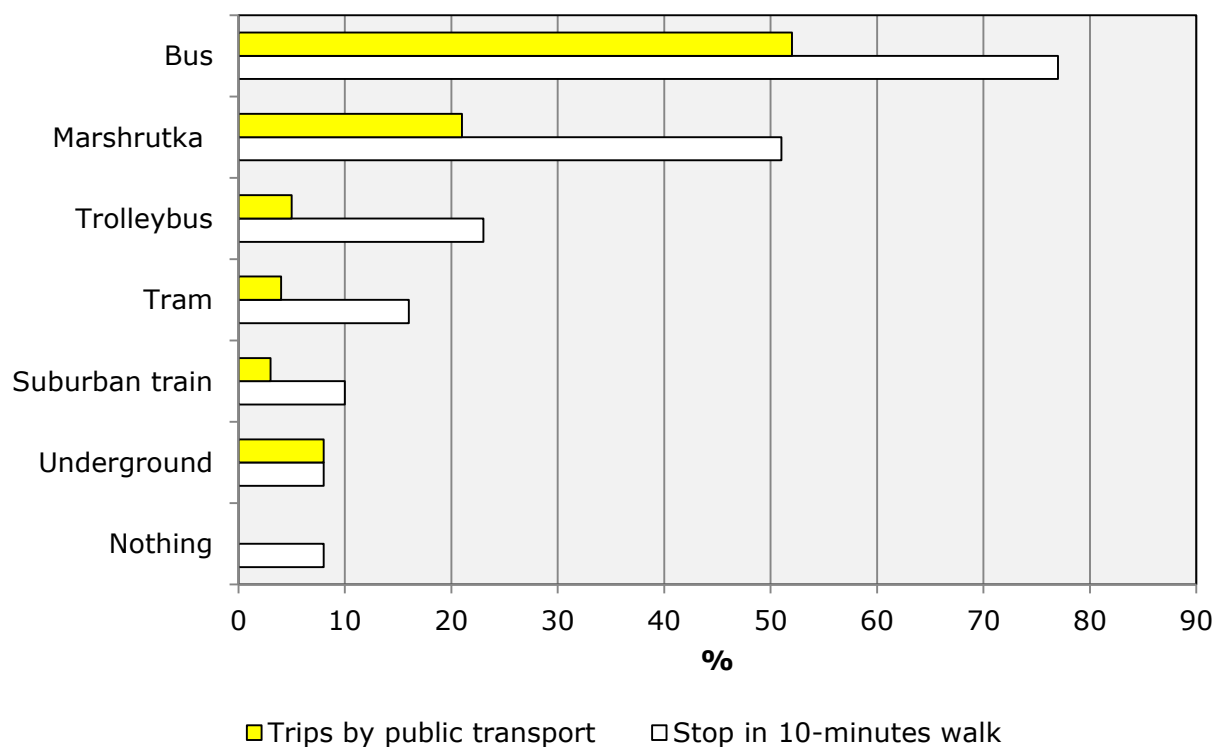

Despite the disparity between the availability and the demand for electrically powered public transportation, 59% of all the respondents are either "totally satisfied" or "satisfied" by the performance of the public transport. 23% use public transport every day, while 26% do not ride it at all.

To some extent, such a situation might be explained by the rise of private automobile ownership. Automobility in Russia is a relatively new subject for research. Between 1993 and 2013, it increased by the factor of 3.6: from 75 to 273 vehicles per 1000 people. Traffic jams and parking problems are the everyday reality in the big cities. Urban and transportation planning have changed slightly to provide traffic capacity for automobiles. Roads are being widened, huge parking lots are being built, tram and trolleybus lines are being discontinued, and suburbs without public transportation are being developed. Financial incentives such as affordable credit, fuel prices, low taxes, and insurance costs encourage car ownership. Moreover, rural areas become isolated because some of them have extremely limited or no public transportation service at all.

One of the questions that the survey posed to the automobile owners was, 'There are two types of people. For the first group, the car is an item of daily necessity while the second consists of those car owners who admit the possibility of getting away without it. What type is more descriptive of you?' The results show that 64.4% of the automobile owners cannot imagine their everyday life without a car, and just 34.4% chose the second answer. Russians love their cars, but only 32% of the car owners who participated in the survey admitted not riding public transport at all.

Nonetheless, the modal split shows the dominance of the walking mode.

Figure 6. Modal Split
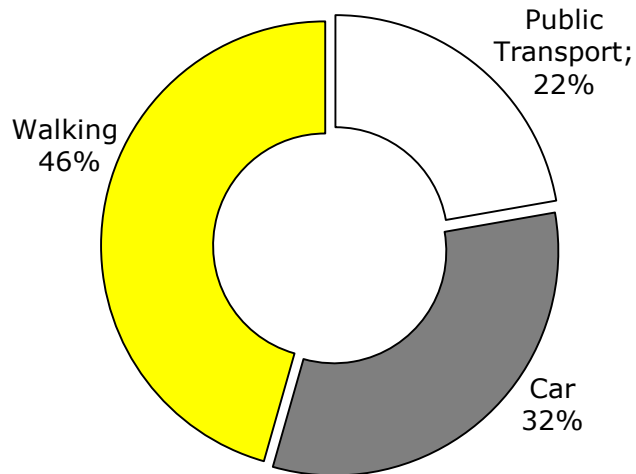
The nature of such distribution has obvious reasons related to the size of population. Public transportation is popular in the biggest cities while its share tends to decrease along with the size of the population in a community. The share of the walking mode is higher than 40% everywhere, while that of the private car usage remains stable.

Figure 7. Modal split by the size of population
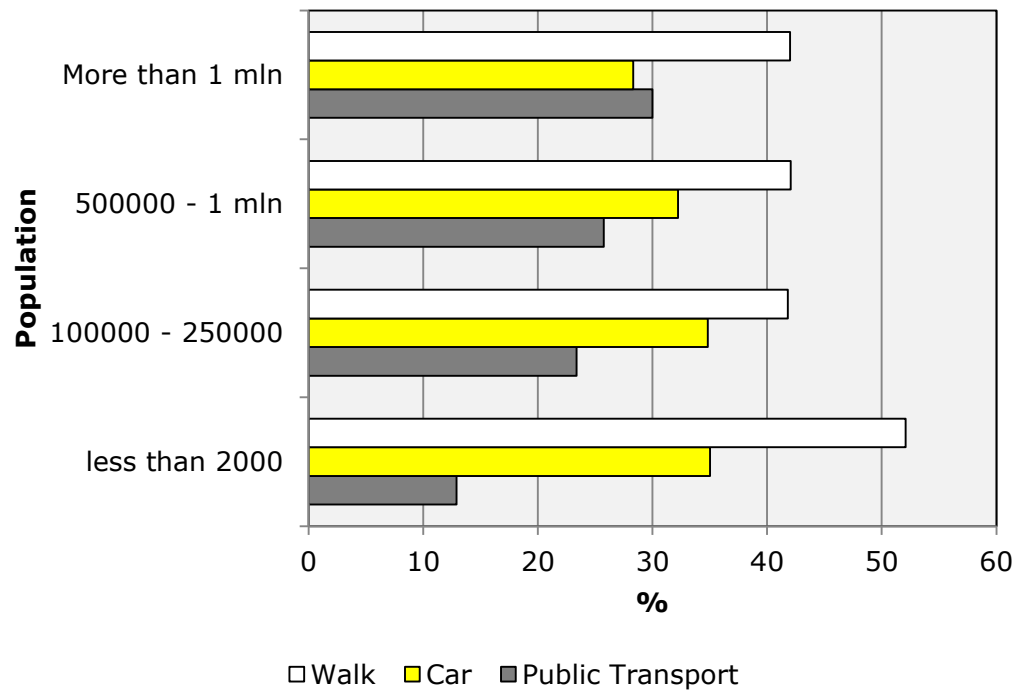
The surprisingly high share of the walking mode might be explained by the high standard of performance by local public services such as shops, schools, sport facilities, etc. In 79% of cases, either "totally satisfied" or "satisfied" were chosen for an answer.

All in all, the distribution by vehicle ownership shows the prevalence of automobile owners. It is also important to mention that the motorization rate among the surveyed was 328 cars per 1000 people, while the average rate for the country in 2014 was 317 cars per 1000 people.

Figure 8. Vehicle ownership
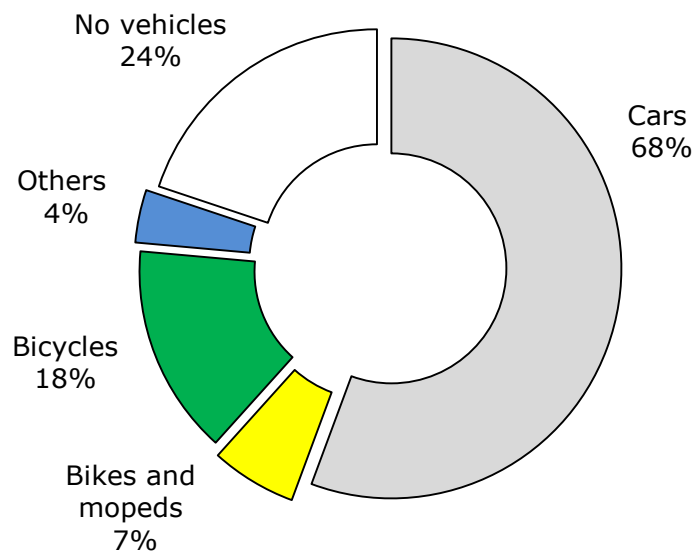
Note: "Other" includes boats, tractors and rototillers.

Distances

The accuracy of distance calculation supplied by the respondents is doubtful. A number of qualitative surveys clarifies that most people find it hard to estimate distance correctly. Therefore the question about distances was only included in the travel diary survey. Table 2 shows results for 4 days of survey. However, it addresses the load on the transportation system rather than the average distances travelled by people because the maximum values appear extremely high.

Table 2. Load on transportation network by travel diary

	1 day	2 day	3 day	4 day
Mean	31.5	27.5	28.2	32.4
Median	12.0	11.6	12.0	13.0
Minimum	0.01	0.30	0.05	0.02
Maximum	1,285.0	1,267.0	1,179.0	1,100.0
Dispersion	5,436.6	3,826.1	3,512.7	4,334.0

A special statistical algorithm helps dealing with outliers (extremely high values). Table 3 shows average distances travelled by people and suggests a typical situation for everyday corporeal mobility.
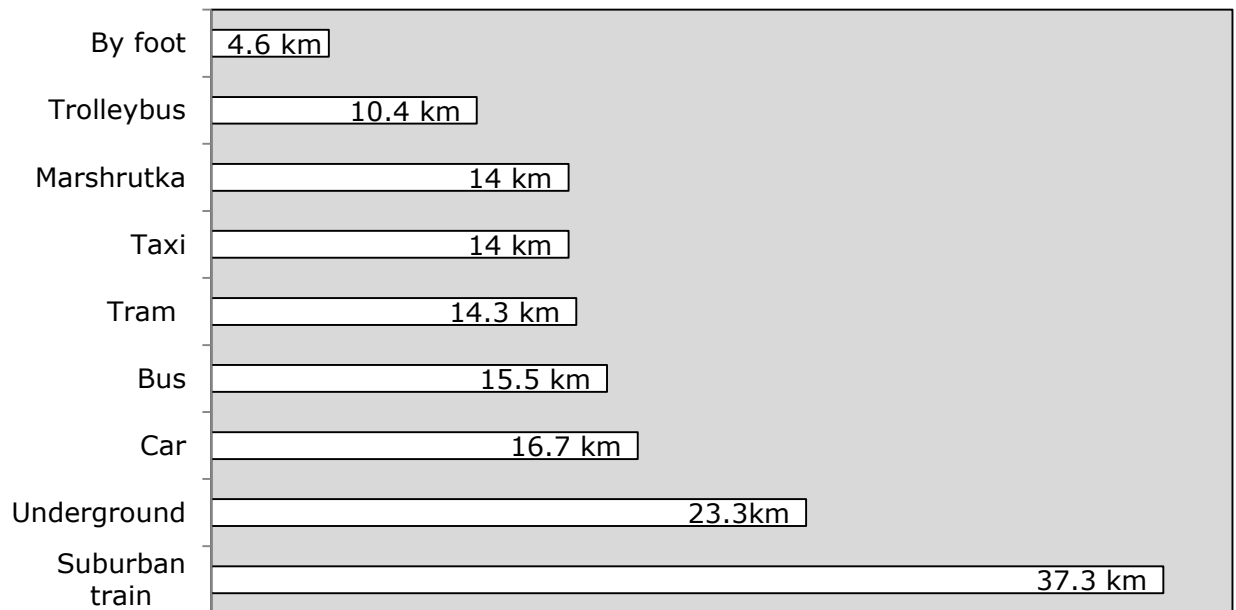
Table 3. An average distances of corporeal mobility

		1 day	2 day	3 day	4 day
Mean		21.1	19.9	20.2	20.8
Median		11.0	11.0	11.0	11.9
Minimum		0.01	0.30	0.05	0.02
Maximum		115	105	110	100
Percentile	10	2.0	2.0	2.0	2.0
	20	3.5	3.0	3.0	4.0
	30	5.0	5.0	5.0	5.2
	40	8.0	8.0	8.0	8.0
	50	11.0	11.0	11.0	11.9
	60	16.0	15.0	15.0	16.0
	70	25.0	22.0	22.0	24.0
	80	36.0	33.0	34.3	37.0
	90	56.0	55.3	52.0	56.0

The percentiles show that 10% of the less mobile population takes 2 km trips per day in total. On the other hand, 10% of the hyper-mobile respondents cover 56 km, which is more than 28 times as long. Finally, the median value for all 4 days is 11 km while the mean value is 20 km.
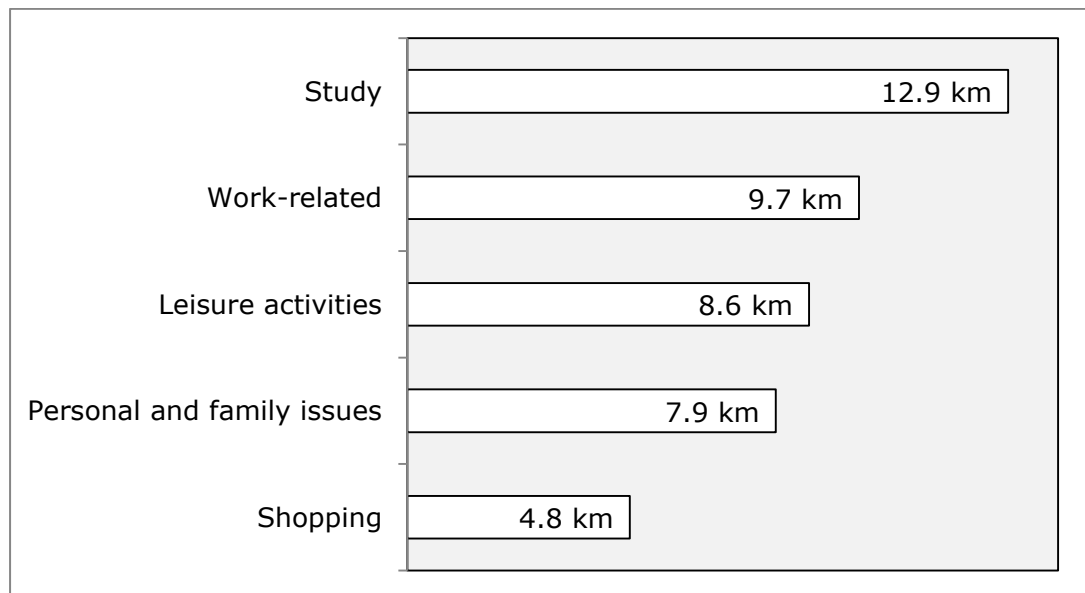
Figure 9 shows that suburban rail is the most long-range transport for everyday use. Surprisingly, the private car usage makes for only a half of that. However, means of public transportation such as buses, trams, and trolleybuses have even smaller values.

Figure 9. Average distances by mode of transportation

Mode	Distance
By foot	4.6 km
Trolleybus	10.4 km
Marshrutka	14 km
Taxi	14 km
Tram	14.3 km
Bus	15.5 km
Car	16.7 km
Underground	23.3km
Suburban train	37.3 km

The comparison by travel purpose shows that shopping is the closest destination for most respondents. It takes 6.7 kilometers in average to reach a store.

Figure 10. Average distance per travel purpose

Travel purpose	Distance
Study	12.9 km
Work-related	9.7 km
Leisure activities	8.6 km
Personal and family issues	7.9 km
Shopping	4.8 km

Travel time

There is a disparity between the travel diary results and the questionnaire survey. The average travel time, based on the telephone

interview, is 20.7 minutes, while the travel diary shows 32 minutes. Median value has similar variation disparity: 15 and 25 minutes respectively. Probability sample allows us to expand boundaries of analysis and take the confidence interval into consideration.

Table 3. Travel time for each trip during a day

		Trips per day									
		1st	2nd	3d	4th	5th	6th	7th	8th	9th	10th
Mean		27	25	23	21	21	21	22	21	14	12
95% Conf. lev.	Low	27	24	22	20	19	19	19	18	10	8
	Up	28	25	24	22	22	23	25	24	18	15
Median		15	15	15	15	15	15	15	15	15	10
Maximum		1	1	1	1	1	1	1	1	1	1
Minimum		290	25	250	240	200	240	180	150	60	60
Cases		6,853	6,113	3,645	2,430	1,267	729	370	217	111	72

The available data allows concluding that people spend more than 8 but less than 28 minutes on each trip.

Long-distance trips

Long-distance trip is a journey that is more than 200 kilometers long and implies overnight accommodation outside the place of residence. One third of such trips are taken for the purpose of vacationing. 37% of all the respondents had not taken such trips in the last 12 months.

Figure 11. Purposes of long-distance trips

Other
3%

Work-related
15%

Vacation
33%

To visit
someone
22%

Personal and
family issues
27%
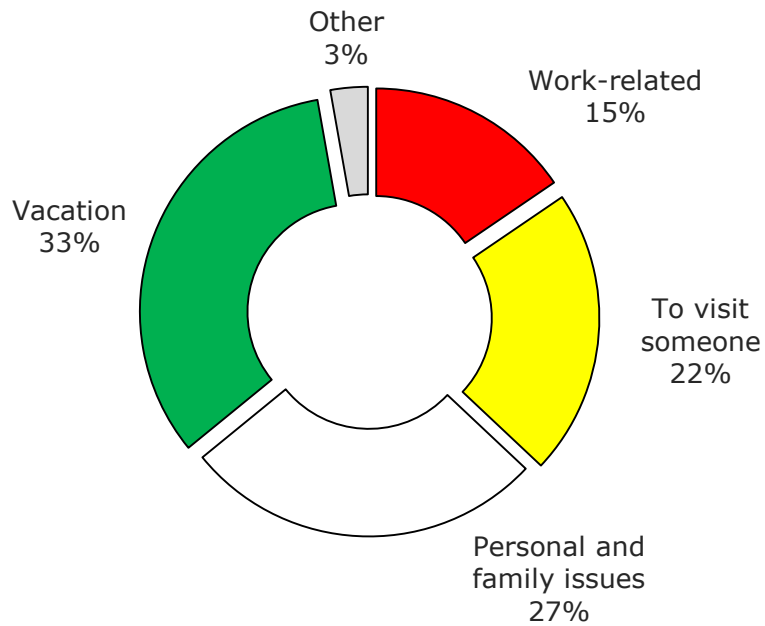
Note: "Other" includes medical trips and leisure activities such as fishing

86% of the respondents took such trips within the Russian Federation while only 13% travelled abroad. Personal and family issues are the most popular reasons for travel across Russia – 27%. Out-of-country trips are made primarily for vacationing – 61%. A private car (including taxi) has a surprisingly big share in terms of long-distance trips.

Figure 12. Modal Split for Long-Distance Trips

Car
52
52

Aircraft
6
31

Rail
20
9

Bus
21
7

☐ Domestic ☐ Abroad
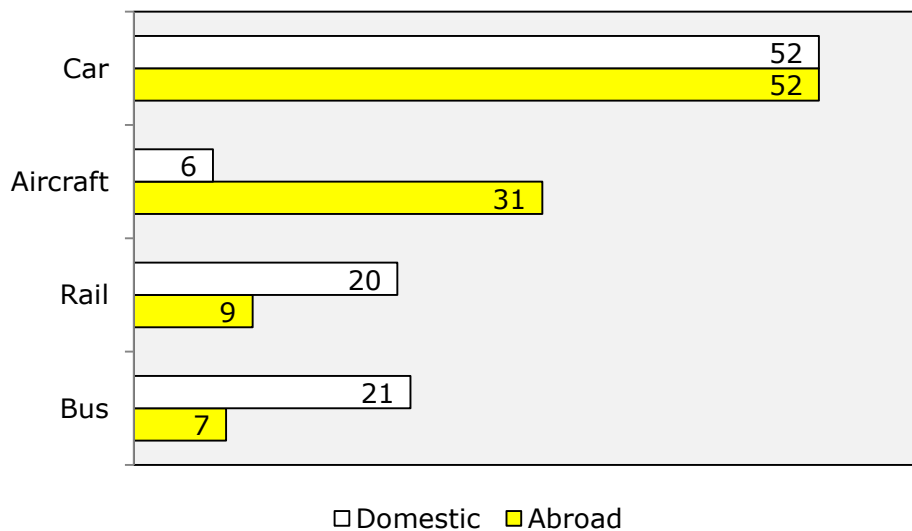
Conclusion

The first nationwide travel survey aimed to achieve three main goals.

First of all, the theoretical basis for this kind of research was examined, based on the respective experience in the advanced countries. Decision-making process should also be included in the analysis in order to outline the consequences of this kind of research.

Secondly, methodological experience could be used for similar research in Russia. Although the regional and federal administrations do not call for collecting this kind of data, it is required as a starting point for future research.

Finally, the data gap has been filled. The average distance is 20 kilometers per day, an average trip takes approximately 21 minutes, walking is the most popular transportation mode, and personal and family issues along with work-related trips comprise the biggest share in the distribution of trips by purpose.

We hope that this survey will contribute to developing the specifically Russian approach to transportation studies and help improve the quality of life.

Literature

Arrak, A. (1982) Social'no-e'konomicheskaya e'ffektivnost' passazhirskix perevozok (na primere avtomobil'nogo transportra) (A Social-Economic effectiveness of public transport (an example of buses). Eesti raamat, Tallin

Efremov I. S, Kobozev V. M., Yudin V. A. (1980) Teoriya gorodskix passazhirskix perevozok: Uchebnoe posobie dlya vuzov (The Theory of Public Transport: a textbook for students). Vysshaya shkola, Moskva

Firsov B.M. (2012) Istoriya sovetskoj sociologii: 1950–1980-e gody (The History of Soviet Sociology)/ Izdatel'stvo Evropejskogo universiteta v Sankt-Peterburge, Saint-Petersburg

Girshson G. (1901) Gorodskie dorogi bol'shoj skorosti: Sooruzhenie, e'kspluataciya i finansovoe polozhenie (The Metropolitans: Construction, Expolitation, Finance Situation). Yablonskiy Publishers, Saint-Petersburg

Lobanov E. M. (1990) Transportnaya planirovka gorodov: Uchebnik dlya studentov vuzov. (Transportation Planning in Cities. A textbook for students.) Transport, Moscow

Shelejxovskij G.V. (1946) Kompoziciya gorodskogo plana kak problema transporta (A Composition of urban plan as a problem of transportation). GIPROGOR, Moscow

Strategiya 2020. (2013) Novaya model' razvitiya - Novaya social'naya politika. Final'nyj otchet po social'no e'konomicheskim problemam Strategii Rossii do 2020 (A New Model for Development – a New Social Policy. The Final Report on Actual Socio-Economic Problems of Russian Strategy till 2020). Izdatel'stvo Delo, Moscow

Zil'bertal', A. (1932) Tramvajnoe xozyajstvo (The infrastructure of tramway). OGIZ-Gostransizdat, Moscow- Saint-Petersburg