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PUBLIC TRANSPORT BETWEEN CENTER AND PERIPHERY IN BISHKEK - LESSONS FROM OTHER CITIES

ОБЩЕСТВЕННЫЙ ТРАНСПОРТ МЕЖДУ ЦЕНТРОМ И ПЕРИФЕРИЕЙ БИШКЕКА - УРОКИ ИЗ ДРУГИХ ГОРОДОВ

Бул макалада Бишкек шаарындагы коомдук транспорттун абалы каралат, ошондой эле калкы жагынан болжол менен бирдей Европа өлкөлөрүнүн башка шаарларындагы коомдук транспорттун анализи баяндалат. Анын жыйынтыгы менен Бишкек шшарындагы коомдук транспортту жакшыртуунун мүмкүн болгон жолдору сунушталат. Макала SUMRICA долбоорунун жыйынтыгы боюнча жазылган.

Өзөк сөздөр: *коомдук транспорт, Бишкек, жүргүнчүлөрдү ташуу, Европа шаарлары, шаардык жүргүнчүлөрдү ташуучу автобустар, троллейбустар, кичи автобустар («маршрутка»).*

В статье исследуется ситуация с общественным транспортом в г.Бишкек, а также дается анализ общественного транспорта в других городах европейских стран с примерно равным населением. На основании результатов предлагаются возможные пути улучшения общественного транспорта в Бишкеке. Статья написана по результатам стажировки по проекту SUMRICA.

Ключевые слова: *общественный транспорт, Бишкек, пассажирские перевозки, европейские города, городские пассажирские автобусы, троллейбусы, маршрутки (маршрутки).*

This article examines the situation of public transport in Bishkek, and also describes the analysis of public transport in other cities in European countries with approximately equal population. Based on the results, it proposes possible ways to improve the public transport in Bishkek. The article was written based on the results of an internship on the project SUMRICA.

Key words: *public transport, Bishkek, passenger transportation, European cities, city passenger buses, trolleybuses, minibuses ("marshrutka").*

1. Description of the problem

Currently in Bishkek, the dependence on road transport modes, especially private cars, is becoming increasingly important. In European countries, the situation is supposed to be corrected by development and improvement comfortable public transport, a complete ban on the entry of private cars into the city center or collect the fees, arrangement of accessible parking places at the most important transport hubs and metro stations, as well as the construction of intracity and outer transport rings .

Every year, many families residing in the suburbs migrate to urban areas in search of better jobs and higher incomes, which has led to an increase in the city's population (residents) (Fig. 1, blue column), and every day a large number of residents of nearby settlements arrive in the city to study in preschool, general education and higher (secondary) educational institutions, for working in various sectors of the economy and for other personal purposes, which are called pendulum migrants.

Research question: Which measures from the European common transport policy can be adopted and applied to the case of Bishkek to build a more resilient and sustainable transport sector?

In Fig. 1 it is observed that, with an increase in population, there is also a significant increase in the city traffic caused by all means of transport (brown column) and by automobile (gray column).

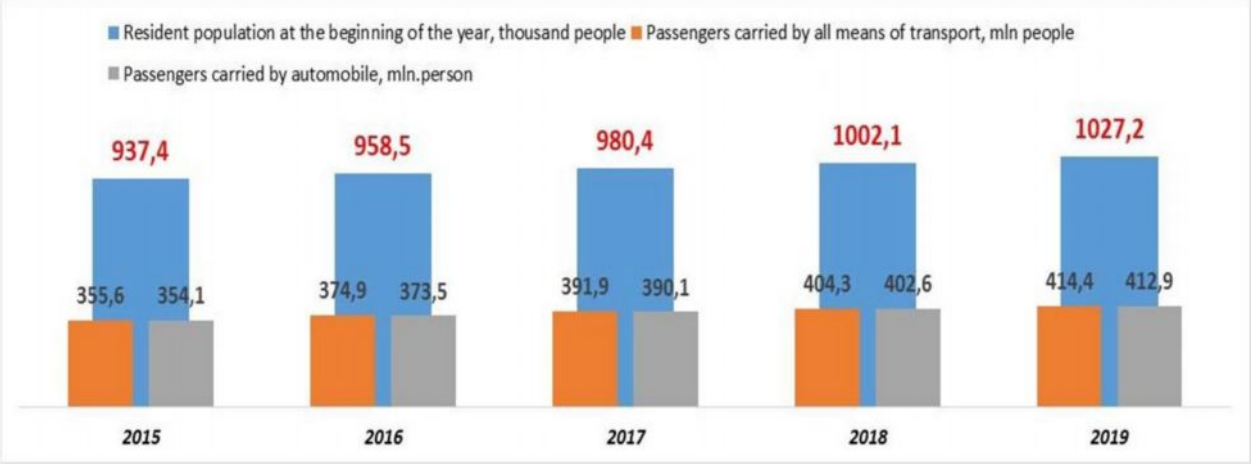


Figure 1 - Comparative diagram of population growth in Bishkek and passenger traffic in the republic

Although many passengers in the city center prefer to use the public transport as a means of daily transport, due to its limited capacity, they are forced to switch to private cars - this leads to higher traffic, long traffic jams and congestion in the area. As a result, the city suffers from heavy pollution [1] which adversely affects the health of the population causing different types of airway diseases. As shown in Fig. 2, more than 90% of Bishkek's population rely on "marshrutka" as their primary mode of transportation.

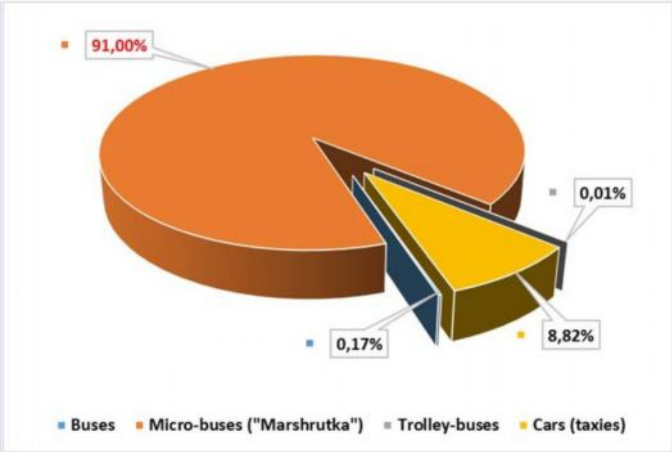


Figure 2 - The share of public transport modes for serving the population of Bishkek [2]

2. Best practices across Europe

Since the city of Bishkek lacks in planning, especially in the case of the public transport sector, learning from the best and most successful practices followed in the European cities is recommended. For this purpose, European cities with similar population size (Table 1) have been identified and how the public transport system works in these cities has been analyzed.

Table 1 – The cities of European countries with a similar population of Bishkek [3]

No.	Town	Country	Population	Area, km ^{2}	Density, people / km²	Types of total transport
1	Prague	Czech	1 324 277	500	2648.55	Tram, trolleybus, bus, metro
2	Belgrade	Serbia	1 386 727	359.92	3852.88	Tram, trolleybus, bus
3	Birmingham	Great Britain	1 137 100	267.8	4964	Tram, metro, bus
4	Ufa	Russia	1 128 787	707.9	1594.49	Tram, trolleybus, bus, train, fixed-route taxi
5	Koln	Germany	1 085 664	405.01	2656	Tram, bus, guide bus
6	Voronezh	Russia	1 058 261	596.51	1767.84	Trolleybus, bus, route taxi
7	Bishkek	Kyrgyzstan	1 055 900	169.9	6226	Trolleybus, bus, route taxi
8	Permian	Russia	1 055 397	799.68	1319.77	Tram, bus, route taxi, electric train
9	Odessa	Ukraine	993 831	162.42	6118.9	Tram, trolleybus, bus, route taxi, inclined elevator line " Odessa funicular "
10	Dnieper	Ukraine	990 381	409,718	2417.22	Tram, trolleybus, bus, metro, route taxi, river transport
11	Naples	Italy	960 231	117.27	8188.21	Tram, trolleybus, bus, metro, funicular
12	Stockholm	Sweden	961 609	188	5139.7	Tram, trolleybus, bus, metro, river transport
13	Frankfurt am Main	Germany	753 056	243.81	2966	Subway (U- Bahn), suburban trains (S- Bahn), tram, bus

2.1 Pull measure to increase public transport ridership

After defining similar cities by population to Bishkek, European cities were analyzed for information regarding their public transport. Many cities applied pull policies to increase usage of public transport.

In **Naples,** it is recommended to purchase a concession ticket [4]. The ticket, also referred to as a card, is valid for three and seven days, which gives the right to use public transport (also includes rail transport) and to visit museums and archaeological zones. In Naples, a new ticket system has been introduced (with the exception of the Alibus ticket): a single ticket is purchased for travel by public transport - UnicoNapoli, which is valid in Naples and its suburbs. Tickets are valid for any type of transport: buses, funiculars, metro, as well as trains.

Berlin's public transport consists of the U-Bahn, S-Bahn, tram system, buses and a ferry network. Berlin's public transport covers not only the city, but also the suburbs within a 15 km radius of the city. The transport network of the city is very well thought out, so it is convenient to make transfers here both from one type of transport to another, and to long-distance trains [5]. In Berlin, public transport uses special lanes and has several types of tickets: for 1 trip, for 2 hours, for one day, for three days, for a week, for a month and for a year [6]. The benefit from one trip will increase with the purchase of a longer ticket. By purchasing a ticket for city transport, a tourist can use it for all transport in the city, without restrictions. Almost every German city with a population of more than 100,000 has applications (official and unofficial) that help to plan a route, display timetables or track traffic using GPS, for example, MVG Fahrinfo for Munich or HVV for Hamburg. There are also transport applications for entire states (Bayern-Fahrplan for Bavaria), or applications for the whole of Germany (Offi-Journey Planner).

Tallinn [7]**.** Many cities are considering making public transport free of charge so that fewer people can use their own cars to reduce the level of pollutants emitted by cars. But in such cases, huge financial resources are needed to maintain urban public transport (in almost all cities of any state, private companies are involved to serve the population with public transport, along with the city hall's transport, and it is also necessary to negotiate with them), to purchase a new electric transport. But there are real-life examples where public transport has been made free. For example, since 2013 city public transport in Tallinn has been made free for all registered residents of the city. Also, the right of free travel is granted to students under 19 years of age, regardless of their place of residence, and is reserved for all groups of beneficiaries who had such a right before.

Public transport in **Zurich** is divided into the following types: traditional (buses, trolleybuses, trams); unconventional (funiculars and S-Bahn trains) [8]. Buses in Zurich move along specially designated traffic lanes, which allows them to easily bypass traffic jams. Tram transport in Zurich is also very popular due to its smooth running, quiet operation, precise adherence to the schedule and independence from traffic jams.

3. Adaptation of practices to the case of Bishkek.

As can be seen from the analysis of the organization of public transport in European cities, one can note their high efficiency in terms of timeliness, safety, comfort, etc., and if we start to implement them in our city, we can make great achievements in a very short time.

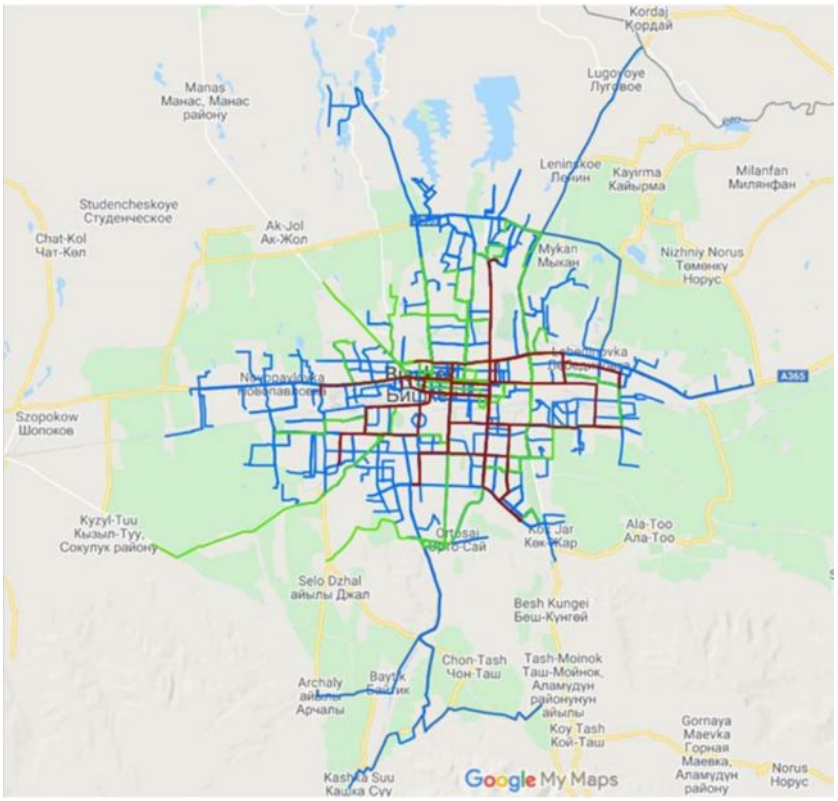
Bishkek also has the following problems with public transport:

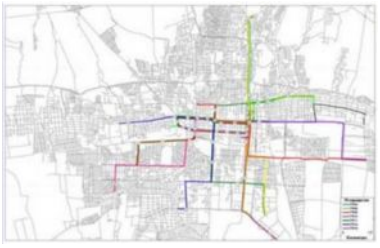
1. The **street-road network does not meet the requirements.** The city street-road network will not be able to service such a number of cars, therefore there are traffic jams everywhere in the city. For the quick and timely provision of services, public transport drivers commit violations of

traffic rules, where there are frequent accidents with injuries of varying degrees of complexity and death.

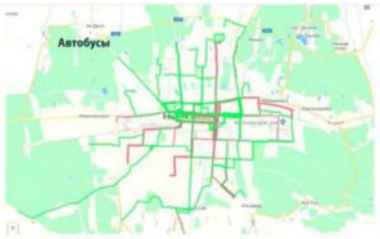
2. Buses and trolleybuses are missing. The Department of Urban Transport under the Mayor's Office of Bishkek informs that today work is underway to clean the central streets of the city from minibuses, so that only buses and trolleybuses run on these sections.

3. **For the organization of road traffic, public transport routes are not equipped with automated control systems, as is the control of public transport traffic.** The city has a Smart Public Transport application, which has a great future. The program (application) contains routes for all types of public transport and also offers the possibility of online tracking of the movement of some trolleybuses and buses. Also a site http://bus.kg/ has been developed, where you can get acquainted with all routes of trolleybuses, buses and minibuses.

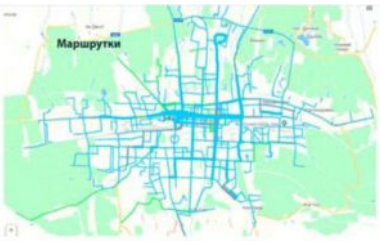




Trolleybus: There are 10 lines, about 110 trolleybuses leave every day.



Bus: there are 15 lines, about 115 buses leave every day.



Minibus: there are 126 lines, about 2,700 minibuses leave every day.

Figure 3 - Service lines of public transport modes in Bishkek

4. Other types of public transport are not being introduced, such as metro, wireless overhead transport. The municipality plans to launch metrobuses (high-speed transport) in the capital, but does not announce any specific dates.

As can be seen from Fig. 3, more than half of the minibuses pass through the central part of the city, which leads to traffic congestions , especially since this type of public transport often violate traffic rules (speeding, crossing continuous lanes, incorrect overtaking etc.), as a result of which there are deaths due to traffic accidents among pedestrians and passengers.

To solve these problems, the following options are offered:

1. In order to attract passengers to use public transport (also, to improve the city life with culture, increase attendance at museums, libraries, etc.), it is necessary to **introduce a unified ticketing system** with a certain validity period, which gives the right to use all types of public transport (including railway lines), to visit various cultural places and events using a number of benefits, and also, it can be called, for the popularization of public transport. For example, in Berlin with one ticket the passengers can use all types of public transport (buses, U-bahn, S-bahn, Wannsee-Kladow ferry) or in Naple with a concession (or unified) ticket locals and visitors can go to museums, theatres, archeological zones and others, which is suitable for Bishkek, thereby activating the work of cultural organizations of our city.

2. The railway is to be laid in the city center and we can confidently assume that it is located very conveniently for **using the railway as urban public transport** with an increase in the number of stops (when combining the schedules of international and intercity flights, it is possible to organize separate rolling stock with convenience for the transportation of passengers), because many residents of suburban areas can get to different parts of the city without delay, then using shuttle buses you can get to the desired place. In this case, new routes appear for drivers of route minibuses.

3. Based on the results of the analysis of the work of public transport in European cities, which have many years of development experience, minibuses (Marshrutka) are not used as public transport, and the city itself is divided into certain sectors, where different prices for tickets. But, public transport uses **a special bus lane,** which saves schedule and increases travel time with safety. Other postsocialist capital cities (Moscow, Tallinn, Almaty) have successfully experiences to reform the public transport system with introduction of special bus lanes and ban minibuses [9] (because (1) Marshrutka is less reliable in terms of safety, and comfort, (2) the monthly ticket prices are unaffordable for students, pensioners and for those who belong to the working-class sector), leaving them outside the central part or outside the city (otherwise this can lead to a social problem, where many minibus drivers may be left without work). The market remains outside the city center, because minibus drivers should have an incentive to work on the outskirts of the city. Due to the decrease in the number of vehicle lanes for public transport, many private car users will switch to using public transport, as public transport is much more efficient and faster. This will decrease the travel time of passengers and traffic jams on the streets, while maintaining safety and comfort during the trip. This will also create a significant positive impact on the quality of the air.

4. Create the **imitation model of organizing public transport** in the center of Bishkek with a special lane (and without) for public transport using the computer program PTV Vissim.

To reduce traffic congestion and increase the demand for public transport, it is necessary to restrict the minibuses from entering the central part of the city. In this case, it is also important to consider the time to deny entry, for example, during peak hours, on certain days of the week or bypassing the line. Having studied the territory of Bishkek (Fig. 3), one can observe that the lines of more than half of the minibuses are laid through the city center, which causes traffic jams, especially during rush hours. Therefore, it becomes necessary to prohibit the entry of minibuses into the central part of the city according of the following limited borders:

1) Shabdan baatyr str. - Zhibek-Jolu av. - Molodaya Gvardia blvd. - Zh.Bokonbaev str. - Manas av. - M.Gorky str. (Fig.4): AB – 3,6 km, BC – 3,9 km, CD – 1,0 km, DE – 1,0 km, EF – 1,9 km, FA -5,0 km. The perimeter of the site is 15,9 km. Area ≈14,9 km^2.

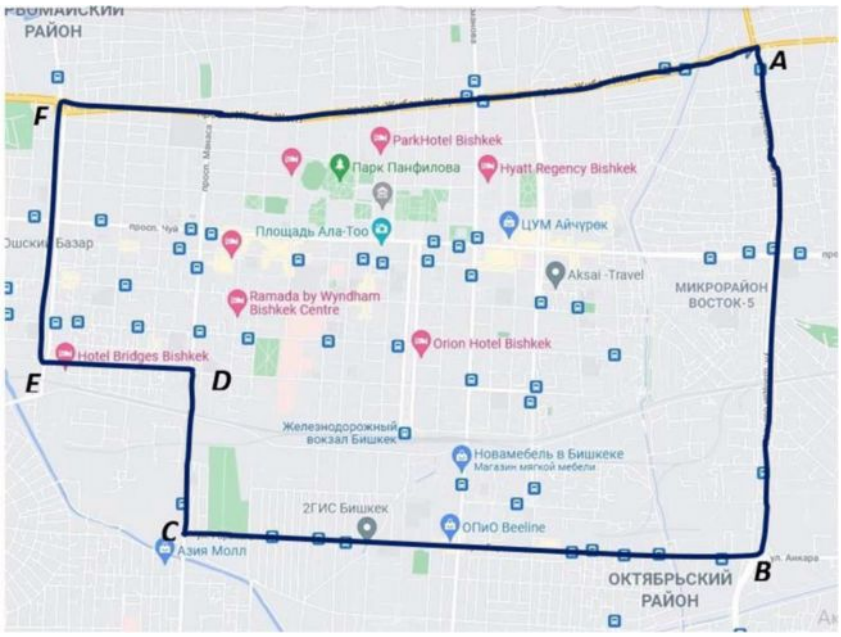


Figure 4 - Proposed 1st variant of the borders for the prohibition of entry into the building of fixed-route minibuses

2) Shabdan baatyr str. - Zhibek-Jolu av. - Molodaya Gvardia blvd. - Zh.Bokonbaev str. - Manas av. - I.Ahunbaev str. (Fig.5): AB – 5,2 km, BC – 3,9 km, CD – 2,7 km, DE – 1,0 km, EF – 1,9 km, FA -5,0 km. The perimeter of the site is 19,7 km. Area ≈20,9 km^2.

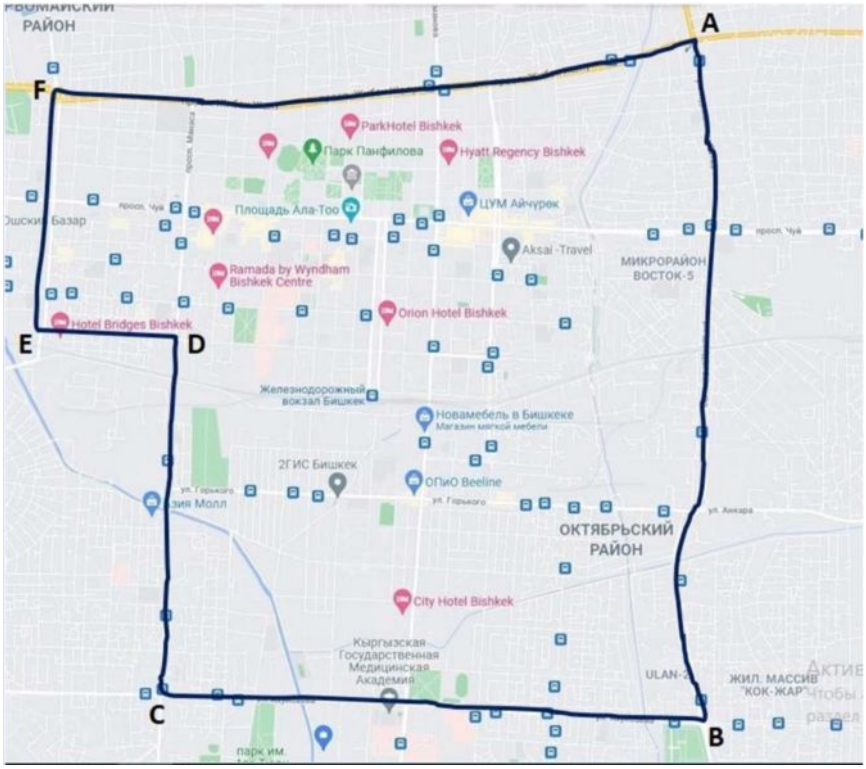


Figure 5 - Proposed 2-nd variant of borders for the prohibition of entry into the building of fixed-route minibuses

Conclusion. Based on the results of the analysis, possible options are proposed. These options were introduced and tested in cities of European countries and have shown positive effects, since they have been studied in depth by experts from various institutes that specialize on improving the efficiency of urban public transport. In Kyrgyzstan, there is currently an emerging need for a Center to study the intensity of traffic flow. This also addresses the need for finding an

optimal solution with the involvement of scientists who can carry out research studies to explore the possibilities for designing special lines for public transport in the central part of Bishkek (fig. 5 and fig. 6). In the future, the demand for reducing traffic congestion and for improving the air quality will rise sharply and hence it is necessary to introduce a ban on minibuses entry to the central part of the city.

Investigation of successful implementation of special lanes for public transport in European cities like Berlin and Zurich were also part of my internship in Berlin.

Also, the ticketing system, which until now only consisted of monthly tickets for schoolchildren and adults, needs to be supplemented with tickets that calculate fares based on time and distance. From an economic point of view, this is more convenient for passengers and, therefore, increases the attractiveness of public transport.

During the internship I created an imitation model of the operation of public transport using the PTV Vissim, where tangible positive results were observed.

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