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Improving Transport Services in Bryansk

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ABSTRACT

The object of the study of the article is the passenger transport network of the city of Bryansk. The task of improving transport services for the population is solved in the context of modernising vehicle fleet, transport infrastructure and in-depth implementation of digital technologies. The analytical method allowed to assess the state of the transport system of the city of Bryansk. The assessment touched upon several interrelated areas that provide a high quality of transport services. The data were obtained by studying open Internet resources, including the website of the administration of the city of Bryansk, and through field observations.

Work on updating the fleet of route vehicles is carried out within the framework of the «Concept for development of public transport in the city of Bryansk for the period 2015–2025», which over the past four years has led to a significant renewal of the bus fleet of medium and large capacity and to the decrease in the share of buses of small capacity. The road network has also been significantly upgraded.

The routes of urban passenger transport have been analysed from the point of view of the degree of duplication. Guidelines for improving the routes of the transport network are proposed.

Keywords: transport, urban passenger transport, transport network, duplication of routes, passenger transportation.

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INTRODUCTION

Many large cities experience a situation when several routes duplicate each other. This leads to excessive congestion of streets, additional emissions of exhaust gases, a decrease in profitability of routes, a lack of transport for organising passenger transportation throughout the city [1; 2].

This problem is of particular relevance in the case of a large length of urban routes and a large passenger flow. This fully applies to the city of Bryansk, which includes four districts remote from each other. The districts are connected by main roads of 4–6 lanes, the main routes pass through them, connecting Bezhitsky, Fokinsky and Volodarsky districts mainly through the central Sovetsky district of the city.

MATERIALS AND METHODS

The *subject* of this study is to assess duplication (combination) of individual routes of the urban passenger transport network of the city of Bryansk, in which passenger transportation is carried out both by municipal transport, including large-capacity buses operating on 47 routes and trolleybuses operating on 13 routes, and by commercial transport, consisting of shuttle vehicles of small capacity, operating on 40 routes [3; 4].

The improvement of urban passenger transportation is based on the «Concept for development of public transport in the city of Bryansk for the period 2015–2025»[1], within which a number of measures have already been completed: the bus fleet of municipal auto enterprises has been replaced by almost 100 %, new roads have been planned and put into operation, a number of roundabouts have been built [3], studies of individual passenger flows have been partially conducted [5]. Several measures have been introduced that have made it possible to digitalise passenger transportation (installation of GPS/GLONASS receivers that display the position of vehicles on an electronic map, in mobile applications; the introduction of digital cashless payment, etc.)[2][6]. Currently, the issue of replacing a completely worn-out fleet of trolleybuses is being worked out (including by filing an application under the federal program) [7]. It is planned to purchase one hundred new trolleybuses (the first batch has already been purchased and is expected to be delivered), public transport routes are being adjusted. When choosing trolleybuses, options for acquiring a part of trolleybuses with a power storage allowing autonomous operation are considered. The relevance of correcting public transport routes is confirmed by the works of both domestic authors [8–10] and foreign ones [11–13].

THEORY AND PREREQUISITES

Improving the routes of urban passenger transport by most authors [14–16; 18] is proposed through finding the most duplicate routes and their consecutive exclusion or adjustment.

The author [17] proposed a new method for determining the route duplication indicator using the route adjacency indicator, which takes into account directions and volumes of passenger origin-destination trips, which, according to his calculations, allows solving transport planning problems more correctly. However, this method requires a significant amount of research, and, consequently, time and financial costs. For initial assessment of routes, it is advisable to use the former method, applying which routes are divided into three groups according to the degree of route overlap (duplication), classified according to the length of the coincidence of the route in question:

• The first group is characterised by a low degree of coincidence (from 30 to 50 % of the length of the route) with the possibility of synchronising the schedule of matching routes or combining them into a single, longer one.

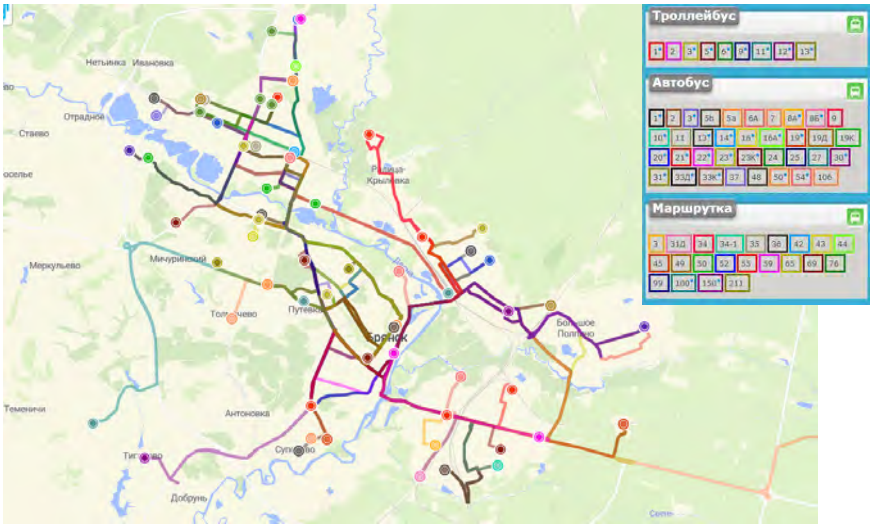
• For the second group, the degree of coincidence is average (from 50 to 75 % of the length of the route), one of the routes needs to be cancelled or the schedule needs to be adjusted.

• The third group is characterised by a high degree of coincidence (over 75 % of the length of the route), which is inappropriate, therefore, a detailed spatial analysis of such routes is required.

The primary task of spatial analysis is to study roads with a large number of duplicate routes, i.e., belonging to second and third groups.

[1]. Resolution of the BCA dated March 23, 2015 No. 772-p «On approval of the «Concept for development of public transport in the city of Bryansk for the period 2015–2025». [Electronic resource]: http://bga32.ru/uploads/2016/06/bga32-ru-Post-772_23–03–2015.pdf. Last accessed 10.12.2021.

[2] Official website Public transport of the city of Bryansk. [Electronic resource]: http://www.transport32.ru/. Last accessed 10.12.2021.



Pic. 1. Map of the network of the municipal passenger transport of the city of Bryansk. [Compiled based on the data of the website: Routes of public transport of Bryansk]. [Electronic resource]: https://www.eway24.ru/ru/cities/bryansk. Last accessed 02.12.2021.

Table 1

Routes of the city of Bryansk with a high overlapping

The second group of routes (from 50 to 75 %)		The third group of routes (over 75 %)	
M-10 – M-28 (50 %)	M-10 – M-36 (50 %)	M-3 – M-31 (90 %)	M-10 – M-35 (100 %)
M-10 – M-42 (50 %)	M-44 – M-42 (57 %)	M-28 – M-49 (84 %)	A-8 – M-99 (83 %)
M-10 – M-43 (50 %)	M-44 – M-49 (52 %)	M-44 – M-36 (75 %)	A-11 – M-99 (81 %)
M-28 – M-88 (60 %)	M-44 – M-52 (57 %)	M-47 – M-34 (78 %)	A-23 – M-99 (80 %)
M-28 – M-99 (60 %)	M-45 – M-43 (50 %)	M-47 – M-38 (77 %)	A-3 – A-54 (96 %)
M-34 – M-35 (50 %)	M-47 – M-35 (56 %)	M-49 – M-99 (78 %)	A-54 – A-3 (97 %)
M-34 – M-47 (70 %)	M-47 – M-43 (70 %)	M-49 – M-52 (82 %)	M-55 – A9 (92 %)
M-34 – M-49 (50 %)	M-47 – M-99 (54 %)	M-50 – M-34 (75 %)	M-38 – A-11 (85 %)
M-35 – M-10 (52 %)	M-49 – M-28 (62 %)	A-37 – M-28 (77 %)	M-10 – A-25 (75 %)
M-35 – M-34 (70 %)	M-49 – M-38 (63 %)	A-3 – M-36 (91 %)	M-35 – A-10 (78 %)
M-35 – M-38 (50 %)	M-49 – M-88 (59 %)	A-54 – M-36 (80 %)	M-69 – A-27 (91 %)
M-35 – M-47 (70 %)	M-50 – M-47 (52 %)	A-11 – M-38 (85 %)	M-3 – A-31 (90 %)
M-35 – M-49 (50 %)	M-50 – M-52 (60 %)	A-48 – M-43 (75 %)	M-34 – A-31 (86 %)
M-35 – M-52 (60 %)	M-50 – M-59 (74 %)	A-1 – M-52 (99 %)	M-47 – A-31 (97 %)
M-35 – M-99 (70 %)	M-52 – M-38 (52 %)	A-11 – M-52 (95 %)	M-43 – A-48 (82 %)
M-36 – M-42 (67 %)	M-52 – M-99 (73 %)	A-9 – M-55 (91 %)	M-65 – M-59 (77 %)
M-36 – M-44 (64 %)	M-55 – M-59 (58 %)	A-8 – M-59 (86 %)	T-1 – T-6 (80 %)
M-38 – M-42 (74 %)	M-55 – M-65 (62 %)	A-10 – M-76 (93 %)	T-6 – A-11 (93 %)
M-38 – M-47 (73 %)	M-59 – M-65 (54 %)	T-2 – M-43 (96 %)	T-2 – M-45 (96 %)
M-38 – M-49 (74 %)	M-65 – M-55 (70 %)	T-9 – M-50 (81 %)	T-9 – T-11 (89 %)
M-42 – M-36 (65 %)	M-69 – M-34 (53 %)		
M-42 – M-38 (69 %)	M-69 – M-45 (58 %)		
M-43 – M-47 (74 %)	M-69 – M-47 (58 %)		
M-99 – M-52 (70 %)	M-88 – M-49 (59 %)		
	T-9 – A-50 (68 %)		

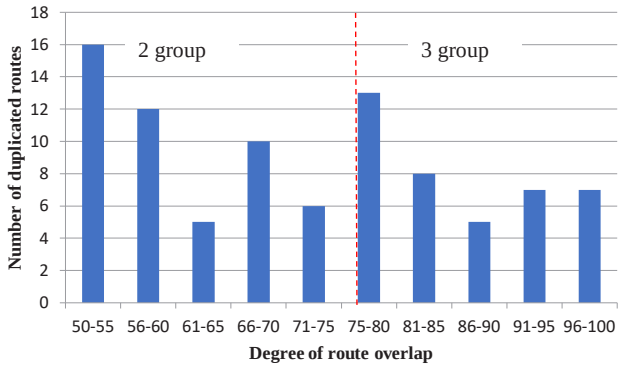
Remark: M – jitney, A – bus, T – trolleybus.

RESULTS AND DISCUSSION

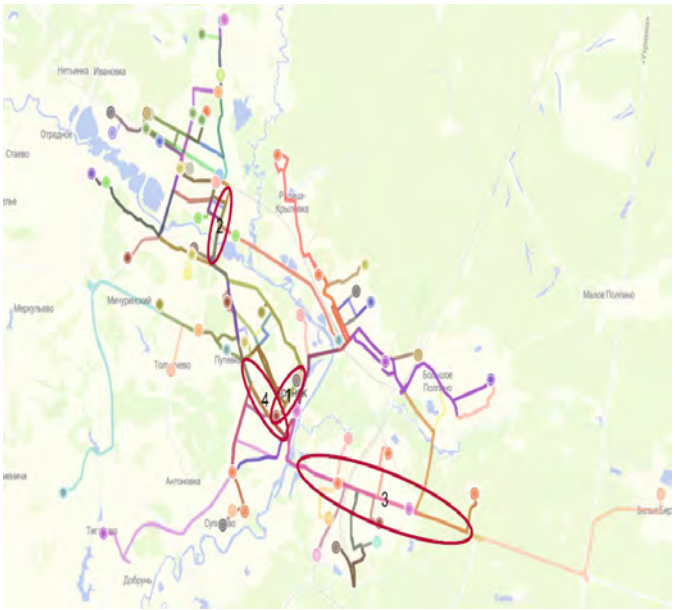
According to this methodology and data [18], the routes were distributed according to the degree of duplication. Their visualisation is shown in Pic. 1. Routes with a high degree of overlap (second and third groups) are presented in Table 1.

Considering routes with a high degree of overlap, it should be noted that most commonly duplication refers to routes of jitneys (48 out of 49 in the second group and 10 out of 40 in the third group). Municipal transport, represented by buses and trolleybuses, is duplicate by jitneys (27 out of 40 in the third group), while there are six trolleybus routes duplicated by buses and two trolleybus routes duplicated by trolleybuses. The duplication of trolleybus and bus routes is currently associated with a lack of serviceable trolleybuses; to solve the problem of replacing the trolleybus fleet, it will be necessary to adjust these routes.

The largest number of duplicate routes pass through the main transport arteries of the city



Pic. 2. Distribution of the number of routes by degree of overlap [Compiled by the authors based on the data of the website: Routes of public transport of Bryansk]. [Electronic resource]: https://www.eway24.ru/ru/cities/bryansk. Last accessed 03.12.2021.



Pic. 3. Streets with the largest number of duplicate routes [Compiled by the authors based on the data of the website: Routes of public transport of Bryansk]. [Electronic resource]: https://www.eway24.ru/ru/cities/bryansk. Last accessed 03.12.2021.

(Pic. 3): prospekt Lenina – 18 routes (1), ulitsa Ulyanova – 19 routes (2), Moskovsky prospekt – 27 routes (3) and ulitsa Krasnoarmeyskaya – 24 routes (4).

The solution to the problem with duplicate routes could be found by organising passenger transportation in the city using a single travel document, for example, as in Moscow, where, according to the data[3] «from September 1, 2021, in buses, trams and electric buses it is possible to make transfers for free, subject to payment by card «Troika» at the tariffs «Wallet» or «Single for 60 trips» within 90 minutes and route changes. When travelling at the «Wallet» tariff, 42 rubles are debited for the first trip, and 0 rubles – for subsequent trips. When travelling at the «Single» tariff, only one trip is written off, no matter how many modes of transport the passenger changes. The use of such a system in the city of Bryansk would make it possible to shorten some routes limiting them by the main transfer points (for example, Bus Station, ploshchad Lenina, Aeropark and some others – their list was established by previous studies [18]), removing duplicate routes and reducing traffic congestion main roads.

To unload existing routes, several new roads have been built, for example, a protective road, Bryansk 1–Bryansk 2 dam (Pic. 4), which connected Fokinsky and Bezhitsky districts, bypassing the centre (Sovetsky district), which

[3] Fare payment in Moscow. [Electronic resource]: https://www.tutu.ru/2read/articles/moscow_fares/. Last accessed 03.12.2021.

Pic. 4. Built protective road, Bryansk 1–Bryansk 2 dam [Compiled by the authors based on the website article: In Bryansk, the construction of the road from the rail station to the «Metro» store has started]. [Electronic resource]: https://news.nashbryansk.ru/2019/11/13/routine/nachalos-stroitelstvo-dorogi-bryansk-1—-bryansk. Last accessed 03.12.2021.

Pic. 5. Planned road [Compiled by the authors based on the website article: The authorities of Bryansk presented a project for a new road from the Telecentre to the Black Bridge. With two new «rings»]. [Electronic resource]: https://bryansk.news/2021/11/22/proekt-dorogi-telecentr. Last accessed 03.12.2021.

made it possible to get 30–40 % faster between districts. To use it, the townspeople turned to the transport department of the city administration with a request to launch a bus on a new road between Volodarsky and Fokinsky districts, organising a new route or changing existing ones: «Meat processing plant–railway station–Druzhba (or Worsted plant)», «Meat processing plant–railway station–Avtozavodets microdistrict» or «Bordovichi–Snezhetskaya station» (connection of routes 19 and 16A). This direction of the route will unload the longest trips on the 31st route[4].

It is also planned to build new roads, for example, a four-lane road from the Telecentre to the bridge in Fokinsky district (Pic. 5), with the beginning at the intersection with the 4th Karachizhsky lane, down to the river Desna and along the coast with access to ulitsa Kalinina near the bridge. New roundabouts are provided on both sides, as well as two elevated pedestrian crossings[5].

CONCLUSIONS

1. The existing route passenger transportation network of the city is imperfect and, in its

[4]. In Bryansk it was proposed to develop a bus route for the new road [Electronic resource]: https://www.bragazeta.ru/news/2021/09/27/v-bryanske-aktivisty-predlozhili-pustit-avtobusnyj-marshrut-po-novoj-doroge/?utm_source=yxnews&utm_medium=desktop. Last accessed 03.12.2021.

[5] The authorities of Bryansk presented a project for a new road from the Telecentre to the Black Bridge. With two new «rings». [Electronic resource]: https://bryansk.news/2021/11/22/proekt-dorogi-telecentr/. Last accessed 03.12.2021.

development, should take into account the prospects for development of the road network, as well as the opinions of initiative groups of city residents.

2. When analysing route overlap, a large number of duplicate routes of groups 2 and 3 were found.

3. Duplication of trolleybus and bus routes is currently associated with a lack of serviceable trolleybuses, and when they are replaced, these routes need to be adjusted.

4. To solve the problem of duplication of jitneys, it is necessary to improve the identified duplicate routes, as well as to introduce new bus and trolleybus routes instead.

5. It is expedient to organise passenger transportation in the city with a single travel document that allows making transfers free of charge for a limited period of time, which would reduce the load on the city's transport network.

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