

A PROMISING, ALTERNATIVE FORM OF URBAN PUBLIC TRANSPORT

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Introduction. The urban public transport system in Almaty faces many problems. Every year about 3-3.5 thousand people die on the roads of Kazakhstan, indicating a high accident and mortality rate. In Almaty, one of the most polluted cities in the world, traditional modes of transport contribute to environmental degradation and noise pollution. Buses and cars are often stuck in traffic jams, reducing their efficiency and causing inconvenience to passengers. High operating costs and the need for significant capital investment make the development of traditional modes of transport uneconomical. Existing transport solutions also fail to cope with the problem of social exclusion and accessibility for low-income neighbourhoods. International examples, such as the cable cars in Medellin and Rio de Janeiro, show that BRT can be an effective alternative. Almaty requires an innovative transport solution that is safe, environmentally friendly, cost-effective and high capacity.

Literary review. Analyses of recent studies and publications show that the introduction of passenger aerial tramways (PATs) can significantly improve the transport situation in megacities. Studies in Medellin, Colombia, and Rio de Janeiro, Brazil, demonstrate the successful use of PPCDs to reduce traffic congestion, reduce pollutant emissions and improve transport accessibility for low-income neighbourhoods. At the same time, however, high initial capital investment and the need to adapt the technology to specific urban conditions such as topography and density remain problematic issues [1-3].

In addition, studies show that BRT can significantly reduce travelling times and improve overall passenger safety through dedicated routes and modern security systems. However, one of the main challenges is to integrate the AIP into the existing transport infrastructure and provide seamless connections to other modes of public transport. Issues of social acceptance and trust in the new mode of transport also require attention, as the successful examples of Medellín and Rio de Janeiro show that not only technical but also social adaptation of the project is important [4-5].

Additional studies show that BRT has significant potential to reduce operating costs and improve the economic efficiency of urban transport. For example, in Medellín, the operating costs of BRT have been found to be significantly lower compared to buses and metro, resulting in significant savings to the city budget.

However, one of the problematic issues is the financing of the initial construction phase, which requires large capital investments and government support.

Also an important aspect is the environmental sustainability of PPKD. Studies confirm that the use of ASCP contributes to the reduction of carbon dioxide and other pollutant emissions, which is especially relevant for cities with high levels of air pollution, such as Almaty. At the same time, more research is needed to assess the impact of ASCPs on the ecosystems of urban areas in order to minimise possible negative environmental impacts.

Finally, socio-economic studies emphasise the importance of including public opinion and community participation in the planning and implementation of the RKCP. Successful examples from Latin America show that involving citizens and taking their needs into account contributes to a higher degree of acceptance and satisfaction with the new mode of transport. Nevertheless, Almaty may face additional social barriers related to the adaptation of the population to the new type of transport and the change of the usual way of life [6-8].

Purpose. Current transport solutions are inefficient and require significant capital investment and high operating costs. Existing transport systems do not cope with the problem of social exclusion and limited accessibility for low-income areas of the city. The purpose of this article is to analyse the advantages of using passenger aerial cable cars (PACC) as an alternative mode of public transport for Almaty. Based on successful international experience, in particular the cities of Medellin (Colombia), Rio de Janeiro (Brazil) and other cities with similar topographical and socio-economic conditions, the article seeks to propose strategic directions and practical recommendations for the introduction and operation of PPCDs in Almaty. The main objective is to assess the economic feasibility, environmental sustainability and social significance of the PPKD, as well as to develop a plan for the phased construction and integration of cable cars into the existing transport system of the city.

Summary of the main material. PPKDS have a number of undeniable advantages over cars, trams, trolleybuses, railways and future urban aircraft for rich people who bear the signs of elitism.

The first and most important thing is safety. Everyone knows that about 3 – 3.5 thousand people die on the roads of Kazakhstan every year [1]. And no amount of money can measure a person's life. An integrated safety system is now widely used at the PPCD, which ensures the return of the cabin to the station in case of any emergency, even power outages. Uninterrupted operation regardless of weather conditions (except for very strong winds).

The second is the ecological cleanliness of transport. Almaty is one of the ten cities in the world with the most polluted air basin. And these are numerous incurable diseases. There is also a reduction in noise from the operation of machines.

The third is cost-effectiveness. The relatively low volume of one-time capital investments and operating costs required for the construction and operation of the PPCD. The construction of a cable car is ten times cheaper than laying highways, a second line of overpasses, and bridges. It is a hundred times cheaper to build a

subway. The operating costs for transporting one passenger are two times lower than by bus. Minimal energy consumption, because traction motors are not located in every unit of the vehicle, like trams or trolleybuses, but only at the base station.

The fourth is the speed of movement. A significant reduction in the transportation distance, since the routes are laid along the shortest path between the end points with an acceptable slope of 45 °. There is not a single traffic jam, plus comfortable conditions and a beautiful view from the window.

Fifth, there is a large bandwidth. For example, in the city of Medellin, Colombia, one million people use the cable car per month. In this city, cable cars are integrated into the regular metro system. The cable car metro allows you to get to any destination several times faster than by taxi. At the same time, the amount of gas emissions in Medellin decreased by 17,400 tons [2].

The sixth is the reduction of allotments of land plots and the prevention of deforestation of large tracts of forest.

Table 1

Comparative characteristics of different types of public transport in megacities

№	Parameters	Metro-polytene	Mono rail	High-speed tram	Tramwai	Trolleybus	Bus	PPCD
1	Maximum passenger traffic, thousand passengers/hour	30	6	30	18	7	7	6
2	The cost of construction of one km of the line, billion rubles and millions of dollars.	7,5	1,8	2,1	0,8	0,6	0,5	0,3
		111,9	26,9	31,3	12,0	9,0	7,5	4,5
3	Maximum driving speed, km/h	90	45	60	60	60	60	40
4	Average driving speed, km/h	40	15	30	24	20	20	34
5	The area occupied by one passenger per unit, sq. m.	0	0	4	3,1	2,4	3,1	0
6	Energy efficiency factor	0,2	0,15	0,3	0,19	0,17	0,14	0,42
7	Specific energy consumption W*h/t*km	50	100	60	70	90	120	25
8	Specific energy consumption (in liters per 100 passenger kilometers)	1,5	2,0	1,6	2,0	2,3	2,2	0,4
9	The present cost of movement at the maximum passenger flow is thousand rubles/pass and USD.	28,9	100,01	2,68	3,12	2,02	1,21	1,8
		431,4	492,5	40	46,6	9,9	7,9	26,9
10	The present value of the rolling stock, thousand rubles/pass /year and USD/pass /year	2,0	20,0	3,2	3,2	3,2	4,8	0,4
		29,9	298,5	47,8	47,8	47,8	71,6	6,0
11	The cost of a passenger kilo-meter, rubles and dollars.	5,3	3,9	2,8	3,5	2,9	3,8	2
		0,08	0,06	0,04	0,05	0,04	0,06	0,03

Source: Authors' calculations

The above arguments indicate that cable-car transport is quite promising, which reflects the prerequisites for its development that are currently emerging in the world [3].

Since this type of passenger delivery is not yet used as public transport in Almaty, it is necessary to use the successful experience of other countries in this article. In particular, Latin American countries: Colombia; Venezuela, Brazil. That is, such states are similar in a number of topographic conditions and macroeconomic indicators. Such as terrain, standard of living, GDP per capita, inflation, wages and other social indicators. The research method is to study the cases of the best international experience in the use of PPCD in public transport.

In world practice, transport professionals, as a rule, pay special attention to the quality of transport connecting places of residence and destination, as well as the question of how to improve usability. This transportation and supply perspective takes into account various factors such as time, distance, mode, cost, quality, reliability and level of service. Land-use planners usually focus on geographical accessibility, such as the distribution of services and destinations and the distances between them (density, combination of land use, connectivity and passability). In both land use and transport planning, access is measured in terms of the time radius within which destinations associated with options to achieve these goals can be reached. Social service planners focus on options to improve accessibility for certain groups, such as access to employment for the unemployed or access to schooling for schoolchildren. In social planning, accessibility refers to people's ability (or their limitations) to use services and opportunities.

In the study, we chose the city of Medellin in Colombia to study international experience. 2.5 million people currently live in Medellin, and 2,179 thousand in Almaty on May 1, 2023. This city is also located in a mountainous area, as well as the megalopolis of Kazakhstan. Accordingly, GDP per capita: Colombia 6104 USD and the Republic of Kazakhstan 11298 USD. (take-profit.org)

The cable car is a government project funded jointly by the municipality and the Metro de Medellin Company. In the case of Medellin, all three lines were financed from regular capital investment budgets. The financial contribution of Metro de Medellín is based on the calculation of future revenues from increasing the number of passengers using PPCD over 10-15 years, and this difference is justified by the city authorities as a social investment (Brand and Davila, 2011). The construction of the MetroCable had different motives. The cable car was, on the one hand, the idea of getting passengers down from the hills to the subway. And as a way to increase the number of passengers of the still underutilized subway capacity for that time.

Investments in the first MetroCable amounted to about 24 million US dollars at the current exchange rate of 2012. rates (Agudelo et al., 2011). The cost of a kilometer in urban conditions compares favorably with BRT and railway systems and may cause less dissatisfaction among residents, since land requirements are lower than other new transport interventions. Aerial cable cars can carry up to 3,000 passengers per hour [2].

The cable car line is about 2 km long and covers four stations: Acevedo (transfer to the metro), Andalusia, Popular and Santo Domingo. A maximum of 93 cabins can operate on the line, each of which can accommodate up to eight seated and two standing passengers (Agudelo et al., 2011). Thus, the cost of 1 km. The cable car cost \$12 million [2].

The single fare is a "regular" subway ticket (1800 COP is about \$0.50). You do not need a separate ticket to transfer to the subway. The combined fare for the funicular with metro and Metroplus and the use of a prepaid card (tarjeta cívica) reduces the one-way fare by about 200 Colombian pesos. This makes the use of a cable car economically attractive for long-distance trips, where changing to another mode of transport saves about 33% compared to two bus trips (Brand and Davila, 2011). The city also offers a single ticket that allows you to combine public transport modes with some private buses running on so-called integrated roads (rutas). integrands). The choice to make a trip largely depends on the simple question of whether a person can afford it in such a situation: yes or no. Other criteria, such as time, comfort, or safety, are largely secondary in comparison.

In case they decide to make a trip, the expansion and fares of the Metro/MetroCable system gives them the opportunity to reach more destinations than on a regular bus for the same money. This has a positive effect on the social life of the residents. Residents' consideration of travel time includes various aspects: what are the opening hours of the service, how fast the vehicles are and how it changes during the day and how long it takes to get to the station or departure point

MetroCable is open on weekdays from 4:30 to 23:00, that is, from the very early morning. in the morning until very late at night [2]. A big problem for all types of transport in Medellin is the rush. However, the fact that the MetroCable is a continuous conveyor means there is no waiting time for the arrival of the vehicle, but the cabins are constantly arriving and leaving, has a positive effect: people feel less "waiting" because they can see how the MetroCable is moving all the time. At the same time, the streets are heavily congested during rush hours. Buses, cars and taxis get caught in a long traffic jam. This problem, to further solve it, really applies to the MetroCable, which works as the only means of transportation with its own track. It does not depend on any other vehicles in its path. Also, the track is linear, so the MetroCable does not have to do any loops or detours due to the location of the road. Regular buses don't have fixed stops along the way; people just tell the driver to stop to get on or off the bus. This often leads to long delays on the route because the bus has to stop at "every corner". On the contrary, MetroCable has only a few stops, and at stations the booths do not stop, but drive slowly so that passengers can get in and out.

A MetroCable with a speed of 18 km/h (Metro de Medellín, 2013) is not a very fast means of transportation and transportation as such, although modern technologies allow it to be increased to 36-43 km. per hour. This is the sprint speed for rush hour. But, given its specific characteristics (several stops, a dedicated track), users can get to their destination fairly quickly. The path from the river valley to the highest station is 400 m. meters above the valley – it takes about 15 minutes, which is significantly

less travel time than traveling by bus or on foot. However, the access time to the station is a problem. But the conducted research shows that the surveyed people are willing to spend no more than 10-15 minutes walking, and this is a radius of 1-2 km, which can gain sufficient density and population of nearby areas [2].

A regular bus system does not follow a specific schedule and depends on traffic on the streets. This leads to situations where passengers have to wait a long time for a bus without an announcement or the sudden arrival of two or more buses on the same line at the same time. As a continuous pipeline, MetroCable does not have a specific schedule that users must keep in mind. This gives users very high flexibility when planning a trip. However, this means that the timetable does not play an important role for transport users in Medellin, since buses and subways also do not have a fixed schedule. However, in these cases, the waiting time plays the role of the time needed for the trip. The MetroCable closes for maintenance only about ten days a year.

Worldwide Aerial Ropeway (VCD) they are successfully used in various professional fields. But as a full-fledged self-supporting part of urban public transport only since 2004 in the city of Medellin in Colombia [2]. As they say, their brilliantly proven, proven, cheap and simple technologies are already functioning in public transport in several countries of the world. Such as Colombia, Venezuela and Brazil. A number of developing countries, including the Republic of Kazakhstan, are approaching their widespread use. This situation is characterized by the indifference and disregard for the needs of residents of low-income areas that existed at the time. But with the construction of the PPCD, things got off the ground and the governments of Latin American countries, after decades of a policy of forgetting the interests of ordinary fellow citizens, took on social responsibility and turned their faces to this problem. Thus, the operation of MetroCable was supplemented along the way by the construction of socio-cultural and household facilities, improved the image of low-income areas of their cities.

It seems that this trend will affect the Akimat of Almaty city to transform the lives of residents of the northern part of the largest metropolis of the Republic of Kazakhstan. And this will be due primarily to the construction of 3 VCD lines along the beds of the main rivers of the city, not only in the south, but also in the north. Where huge, primary social problems have accumulated, which have not yet been resolved. This issue should be raised to the highest level, as the President of the Republic of Kazakhstan has repeatedly stated the need to create a new government that hears the common people and a new state of social justice. It is necessary to launch a kind of debate with the involvement of the general public so that this project does not turn into a purely tourist, entertainment show and waste of money.

It is necessary to start the construction of the 1st line of the VCD along the riverbed of the Bolshaya Almatinka, then along the Esentai 2nd line and upon completion of the first two lines, build the 3rd line along the Malaya Almatinka River. This will cause a lower burden on the city budget immediately. It will make it possible to do PPCD more efficiently with error correction along the way. The cost of the 1st kilometer of the VKD route will be approximately 4.5 million euros with a

capacity of 3-5 thousand people per 1 hour, and not per day, as proposed in the master plan for the development of Almaty. This will reduce the number of buses by 300-360 units with an average salary of 300 thousand tenge for each driver. The average price of a new Chinese-made urban passenger car and high-capacity electric bus is 200-250 thousand US dollars. The operating costs of transporting the 1st passenger are 2 times higher than on the PPCD. The cost of transportation of one passenger to Almaty costs 250 tenge according to the fleets. Almaty residents have been paying 80 tenge for travel for the last 11 years without changes, but since August 21, 100 tenge on the Onai card, respectively, 150 and 200 tenge in cash. The difference is subsidized from the budget.

As mentioned above, VKD is the only cost-effective, profitable type of public transport in the world after 4-8 years of operation. And public transportation is a social sector subsidized in almost all cities of the world. The volume of subsidies paid to carriers from the Almaty city budget from 2017 to 2020 amounted to 61.5 billion tenge (\$ 153.75 million dollars), and compensation for the transportation of preferential categories of passengers from 2016 amounted to 17.4 billion tenge (\$ 43.75 million dollars), totaling about 79 billion tenge (\$ 197.5 million dollars) in four years. Residents' consideration of travel time includes various aspects: what are the opening hours, services, how fast the vehicles are and how it changes during the day and how long it takes to get to the station or departure point.

In Medellin, as in Almaty, road safety, to put it mildly, has big problems and questions about the effectiveness of public bus transport in general. Many bus operators are private, which means that there is no state control of vehicles, training and condition of the driver. Cases of malfunction of cars, aggressiveness of driving by transport and the drivers themselves, their drug intoxication and drunkenness are far from rare. By comparison, the MetroCable is a very safe means of transportation despite the relatively high crime rate in Medellin. Thanks to the dedicated highway, there are no accidents with other vehicles or pedestrians. It meets the highest modern technical standards and is subject to frequent safety checks. In fact, they have new and always clean rooms of stations and cabins, as well as a strong presence of staff, which makes people feel safe. This is especially true for women: "In MetroCable, women feel safe for several reasons. For most of them, it is important that the cabins carry no more than ten passengers (eight seated, two standing). The cabins are spacious enough that even they are not cramped. Passengers sit in two rows facing each other. This makes it impossible for anyone to grope or touch another person, because everyone notices it. The privacy of passengers is protected. If someone does not feel comfortable, it is possible to change the cabin at each station without wasting time, because MetroCable is a continuous conveyor. At each station, the door opens automatically, and security personnel check each cabin. There is also an emergency button in the cabins" [2].

Thus, the technical result of the proposed solution is to optimize the transport and logistics system of the city, eliminate traffic congestion and ensure rapid movement to any point of the city. The economic result is profitability and the rapid self-sufficiency of this type of public transport within a few years.

Limitations: This study requires a deeper consideration of the technical feasibility of using PPCD in the conditions of the Almaty megalopolis. As mentioned above, two local PPKDS for tourist purposes are successfully operating on the territory of the city of Almaty.

Conclusion. The construction and operation of the VKD refers to the construction of new transport and logistics systems of large cities, and can be used in the expansion and construction of new cities with a population of more than five hundred thousand people, such as Aktobe, Karaganda and Shymkent and, which is especially important for the future Almaty agglomeration with a population of 4.5 million people.

Modern urban development is characterized by the emergence of urban transport crises associated with the formation of congestion, accidents, a drop in the average speed of transport, deterioration of the environmental situation, an increase in accidents and human casualties on the roads, the emergence of psychological tension and a decrease in the energy efficiency of transport.

Accordingly, the importance of the passenger cable car increases many times. There are no serious weather-related restrictions for operation. Cabins protect passengers on the way from all troubles and provide excellent visibility. The capacity of a pendulum railway carriage can reach 100 people.

The construction of a high-performance cable car is tens to hundreds of times cheaper than the construction of roads, bridges, tunnels, LRT, not to mention the subway. This is an environmentally friendly and exotic transport. This is an absolutely real project. The construction of such a cable car would be a bright event not only for Almaty, but also for the whole of Kazakhstan. In world practice, suspended cable cars are one of the most economical and efficient types of passenger transport.

The relevance and significance of the project is outlined above. The scientific novelty of this project is the absence of similar projects on the territory of the Republic of Kazakhstan and throughout Central Asia, including Afghanistan, Pakistan, Iran and Mongolia. It is necessary to carry out scientific and technical calculations on the location of the supports in the places where the PPCD passes. The construction of a passenger suspended cable car will provide year-round and round-the-clock traffic along the entire line of the VCD. Even the underground subway is not capable of this.

This will solve the social, cultural and economic problems of the urban and district population of its low-income strata. Due to its uniqueness and exoticism, the new type of transport will be very popular not only among residents of Almaty, but also guests of the capital of the republic, which will have a positive impact on the financial condition of the project. Given the low capacity of the urban road and street network and the problems associated with the construction of the metro, the implementation of the project will give impetus to the development of a new concept of urban passenger public transport in Almaty.

Studying the experience of operating PPCD, it should be noted that a remarkable discovery is the improvement of general safety near the VCD, combined

with the restoration of surrounding public spaces, after the commissioning of stations and the operation of MetroCable lines. The situation has completely changed with the arrival of MetroCable in Medellín, as evidenced by the large number of tourists, including residents from other parts of the city, who now visit areas near the PPCD stations. In recent years, MetroCable has become the hallmark of the city of Medellín. Residents identify themselves with this new quality condition and are proud of it. It has become a major tourist attraction. Tourists came with MetroCable to the neighborhoods covered by the VCD, enjoying the view of the city and strolling through the stations of the PPCD. This better image of disadvantaged neighborhoods has helped reduce the stigma of residents, which has had a huge impact on their lives.

Thus, MetroCable can be seen as a demonstration of public attention and a kind of symbol of the government's presence. After many years of feeling neglected and indifferent to the needs of ordinary Colombians by the Government, people began to trust the State justice system." (see Cerdá et al., 2012: p. 1048).

In conclusion, it should be said that the VCD is located at an above-ground level and this eliminates the appearance of traffic jams caused by the accumulation of traffic at the junctions of highways, makes it necessary to build expensive road interchanges and horizontal zoning of the territory. The future of public transport within large megacities is the development and improvement of CGT, and their gradual transformation into high—speed air transport capsules with a complex multi-vector and multi-level transport configuration. This is evidenced by the works of the world's leading engineers, which will seem fantastic to us. But this is the real future.

Stages of the commercialization process: 3 stages - justification of investments, design, construction.

The volume of necessary investments for one PPCD line is 36 million euros, the cost of 1 km of track is 4.5 million euros, the length of the PPCD is 8 km.

References

1. Almaty development (2023), available at: <https://web.archive.org/web/20161015025713/http://almatydev.blogspot.com/> (last accessed 15.03.2024).
2. Heinrichs, D., Judith, S. Bernet. (2014). Public Transport and Accessibility in Informal Settlements: Aerial Cable Cars in Medellín, Colombia. available at: <https://doi.org/10.1016/j.trpro.2014.11.005> (last accessed 17.03.2024).
3. Brand, P., Dávila, J. (2011). Mobility innovation at the urban margins: Medellín's Metrocables. *City*, 15 (6) (2011), pp. 647-661, available at: <https://www.tandfonline.com/doi/abs/10.1080/13604813.2011.609007> (last accessed 03.04.2024).
4. Bantis, T., James Haworth. (2020). Assessing transport related social exclusion using a capabilities approach to accessibility framework: A dynamic Bayesian network approach. *Journal of Transport Geography*. Vol. 84, available at: <https://www.sciencedirect.com/science/article/abs/pii/S096669231930701X> (last accessed 03.04.2024).
5. Rafael, H.M. Pereira (2019). Future accessibility impacts of transport policy scenarios: Equity and sensitivity to travel time thresholds for Bus Rapid

Transit expansion in Rio de Janeiro. *Journal of Transport Geography*. Vol. 74, available at: <https://www.sciencedirect.com/science/article/abs/pii/S0966692318302047> (last accessed 05.04.2024).

6. Jinhyung Lee, Junghwan Kim. (2023). Social equity analysis of public transit accessibility to healthcare might be erroneous when travel time uncertainty impacts are overlooked. *Travel Behaviour and Society*. Vol. 74, available at: <https://www.sciencedirect.com/science/article/abs/pii/S2214367X2300039X> (last accessed 05.04.2024).

7. Bi Yu Chen, Yafei Wang, Donggen Wang, William H.K. Lam (2019). Understanding travel time uncertainty impacts on the equity of individual accessibility. *Transportation Research Part D: Transport and Environment*. Vol. 75, available at: <https://www.sciencedirect.com/science/article/abs/pii/S1361920919304869> (last accessed 05.04.2024).

8. Koos Fransen, Tijs Neutens, Steven Farber, Philippe De Maeyer, Greet Deruyter, Frank Witlox (2015). Identifying public transport gaps using time-dependent accessibility levels. *Journal of Transport Geography*. Vol. 48, available at: <https://www.sciencedirect.com/science/article/abs/pii/S0966692315001714> (last accessed 05.04.2024).

9. Masłowski, D., Kulińska, E., Komada, G. (2022). Impact of Alternative Forms of Transport on Urban Freight Congestion. *Sustainability*. Vol. 14(17), available at: <https://doi.org/10.3390/su141710972> (last accessed 05.04.2024).

10. Lee, S., Bencekri, M. (2020). Urban form and public transport design. *Urban Form and Accessibility*, available at: DOI:10.1016/B978-0-12-819822-3.00018-3 (last accessed 05.04.2024).

РЕФЕРАТИ ABSTRACTS

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Рахімбаєв А.Б., Алмагамбетова Ш.Т., Калгулова Р.Ж., Дмитрієва О.І.

ПЕРСПЕКТИВНИЙ, АЛЬТЕРНАТИВНИЙ ВИД МІСЬКОГО ГРОМАДСЬКОГО ТРАНСПОРТУ

Мета. Метою дослідження є аналіз переваг використання пасажирських підвісних канатних доріг (ППКД) як альтернативного виду громадського транспорту для Алмати. **Методика дослідження.** Теоретичною і методологічною основою дослідження є праці провідних вітчизняних і зарубіжних науковців, присвячені розгляду використання пасажирських підвісних канатних доріг (ППКД) як фактора розвитку міського транспорту. В роботі використано методи теоретичного узагальнення, аналізу і синтезу, а також графічні методи. Ці підходи дозволяють комплексно оцінити потенціал і виклики впровадження ППКД в містах з різною топографією і економічними умовами. **Результати.** Наприкінці 20-го століття світові тенденції величезного зростання мегаполісів та урбанізації буквально змусили інженерів міської транспортної інфраструктури шукати інші, неординарні рішення для оптимізації постійно зростаючих пасажиропотоків. Водночас стає зрозуміло, що найбільші мегаполіси світу вже не можуть впоратися з сучасними пасажиропотоками. Ця проблема не могла не призвести до того, що інженери не звернули увагу на канатні дороги як на пасажирські. За результатами дослідження встановлено, що впровадження пасажирських підвісних канатних доріг (ППКД) в міських умовах може значно покращити транспортну ситуацію. Аналіз досвіду таких міст, як Медельїн і Ріо-де-Жанейро, показав, що ППКД сприяють зниженню дорожніх заторів, скороченню викидів шкідливих речовин та підвищенню доступності транспорту для мешканців малозабезпечених районів. Було виявлено, що ППКД мають низькі експлуатаційні витрати, що робить їх економічно вигідними в довгостроковій перспективі. Однак, значними проблемами залишаються високі початкові капітальні витрати і необхідність адаптації технології до специфічних умов міста. Також важливою є інтеграція ППКД у існуючу транспортну інфраструктуру та забезпечення безперебійного з'єднання з іншими видами громадського транспорту. Дослідження підкреслює важливість соціальної адаптації і участі громадськості у плануванні та реалізації проектів ППКД. **Наукова новизна.** Наукова новизна даного дослідження полягає в комплексному аналізі впровадження пасажирських підвісних канатних доріг (ППКД) як інноваційного виду громадського транспорту в умовах мегаполісів Казахстану, зокрема, міста Алмати. Досліджено економічну доцільність, екологічну ефективність та соціальну значимість ППКД, а також запропоновано нові методологічні підходи до їх інтеграції в існуючу транспортну інфраструктуру. **Практична значущість.** Практична значущість дослідження полягає у розробці рекомендацій для ефективного впровадження пасажирських підвісних канатних доріг (ППКД) в транспортну систему міста Алмати, що може сприяти

покращенню екологічної ситуації, зниженню дорожніх заторів та підвищенню доступності транспорту для всіх верств населення.

Ключові слова: канатна дорога, транспорт, економічна ефективність, рентабельність.

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Rakhimbaiev A., Almagambetova Sh., Kalgulova R., Dmytriieva O., A PROMISING, ALTERNATIVE FORM OF URBAN PUBLIC TRANSPORT

Purpose. The purpose of this article is to analyse the advantages of using passenger aerial cable cars (PACC) as an alternative mode of public transport for Almaty. **Methodology of research.** The theoretical and methodological basis of the study are the works of leading domestic and foreign scientists devoted to the use of passenger suspended cableways (PSC) as a factor in the development of urban transport. The paper uses methods of theoretical generalisation, analysis and synthesis, as well as graphical methods. These approaches allow for a comprehensive assessment of the potential and challenges of introducing PSCs in cities with different topographies and economic conditions. **Findings.** At the end of the 20th century, global trends in the huge growth of megacities and urbanization literally forced urban transport infrastructure engineers to look for other, extraordinary solutions to optimize the ever-growing passenger traffic flows. At the same time, it becomes clear that the world's largest megacities can no longer cope with modern passenger flows. This problem could not but lead to the fact that engineers did not pay attention to the cable cars as passenger ones. The study found that the introduction of passenger suspended cable cars (PSCs) in urban areas can significantly improve the transport situation. An analysis of the experience of cities such as Medellin and Rio de Janeiro has shown that BRTs help reduce traffic congestion, reduce emissions and increase the availability of transport for residents of low-income areas. BRTs were found to have low operating costs, making them cost-effective in the long run. However, high initial capital costs and the need to adapt the technology to specific city conditions remain significant challenges. It is also important to integrate PKDs into the existing transport infrastructure and ensure uninterrupted connections with other public transport modes. The study emphasises the importance of social adaptation and public participation in the planning and implementation of BRT projects. **Originality.** The scientific novelty of this study lies in a comprehensive analysis of the introduction of passenger suspended cableways (PSCs) as an innovative form of public transport in the conditions of megacities of Kazakhstan, in particular, the city of Almaty. The economic feasibility, environmental efficiency and social significance of the PSCP are investigated, and new methodological approaches to their integration into the existing transport infrastructure are proposed. **Practical value.** The practical value of the study is the possibility of using its results to develop strategic and tactical monetary policy decisions aimed at stimulating economic development while maintaining low inflation.

Key words: aerial cable car, transport, economic efficiency, profitability.

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