



IMPACT OF WEATHER CONDITIONS ON BUS TRAFFIC ON URBAN ROUTES

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ABSTRACT

When developing a public transport schedule, the factor of the influence of weather conditions on changes in the flow of passengers on the route is not taken into account. The scientific approach to solving this problem requires determining the relationship between the flow of passengers and weather indicators on the bus route. In the article, the authors study the relationship between weather indicators and the flow of passengers on the bus route.

The schedule of public transport depends on the specific flow of passengers, which is usually developed taking into account passenger demand, route distance, types of buses on the route and weather conditions. Weather conditions are one of the main factors affecting the flow of passengers in public transport. When public transport moves along the route, the indicators of change in passenger flow will depend on the level of daily precipitation, humidity, temperature and season. One of the indicators that characterize the dynamics of ticket sales for passengers is the impact of weather conditions. Temperature and humidity are the most important factors affecting the flow of passengers in public transport. Therefore, when developing a schedule of public transport, it is important to conduct research on predicting the dynamics of changes in passenger flow, taking into account weather conditions.

In addition to a number of weekdays and holidays, holidays, holidays and large events that affect the flow of passengers depending on the number of tickets sold, weather indicators also affect such indicators as temperature, humidity and precipitation. Weather indicators play an important role in predicting the flow of passengers in public transport. Temperatures are below -40 and precipitation leads to an increase in ticket sales on weekdays, that is, an increase in the flow of passengers in public transport by about 30%. In the conditions of precipitation and cold temperatures on weekends, the flow of passengers in public transport is significantly reduced compared to working days. Changes in the flow of passengers depending on weather conditions are associated with the geographical possibility of the destination and location of passengers. A scientific approach to this issue requires determining the relationship between the weather and the flow of passengers in public transport.

In the article, we will study the relationship between the flow of passengers and weather conditions on urban bus routes.

Today, the number of permanent residents, visitors, staff and students in Andijan is growing day by day. Transport services for most passengers are bus routes of Alpomish meerosi LLC. In order to improve the quality of passenger transport services, it is relevant to conduct scientific research on changes in passenger flow and factors affecting them on bus routes.

Researchers around the world have conducted many scientific studies to solve these problems. For example, the Department of Meteorology, Freie Universitat Berlin, Germany, K M Nissen, N Becker, o Dahne, M. Rabe, J. Researchers Scheffler, M Solle and u Ulbrich studied how weather conditions in Berlin affect passenger flow. The study showed that the flow of passengers in Berlin public transport is determined by the sale of tickets. The analysis took into account passengers over 7 years of age and passengers using public transport on the basis of electronic payment. Studies have shown that Berlin has increased the share of bus tickets sold by drivers in bad weather [1].

Researchers from the Technical University Dublin - Blanchardstown campus Markus Hofmann and Margaret O'mahon studied bus operation in different weather conditions. During the study, recommendations were developed for dispatchers to take into account the weather conditions when drawing up a schedule of buses. The study analyzed the relationship between changes in passenger flow in weather conditions for 12 months a year [2].

Future Cities Institute, Chinese University of Hong Kong, Shatin, New Territories, Hong Kong researcher Sui Taa, and Jonathan Corcoranb, Francisco Rowec, Mark Hickman have done research to develop models related to local weather conditions based on bus travel time. The study modeled the effect of the weather on the hourly movement of buses, taking into account the functionality of the region. The study was calculated to take detailed weather measurements in transit Smart card dataset bus latency effects and Time Units [3].

Researchers Syeed Anta Kashfi and professor Jonathan Bunker associate professor at Queensland University of Technology, Australia conducted a study on the impact of weather on bus traffic. The study examined the impact of adverse weather conditions on bus traffic. Issues of weather dependence and travel time of bus routes, as well as the impact of private transport on bus traffic in adverse weather conditions were studied [4].

In order to study the factors affecting the transport of passengers in the urban public transport of Andijan, the experience of predicting the transportation of passengers in public transport of developed countries, all factors affecting transport and modern methods of passenger service in public transport were analyzed.

Andijan now has a population of over 3.0 million. In 2020, 8,500 tourists visited our region. If the number of passengers transported by public transport in Andijan during the year is analyzed, this is 104,725,000 people. In Andijan, passengers have a choice of public transport, as only different modes of transport serve passengers. These include Damas, buses, minibuses and taxis.

Passenger flow surveys are carried out on weekdays and weekends. According to the analysis of the works of scientists of the world, the weather conditions on weekends affect the turnover of passengers in public transport more. Another factor affecting the flow of public transport passengers in Andijan is that schoolchildren and students do not use public transport on holidays and school, technical and university holidays. According to studies, this factor of influence is manifested in traffic jams of public transport, that is, in the period from 7 to 9 am. There are several ways to determine the flow of passengers. This can be determined by calculating the flow of passengers in relation to tickets sold and adding the percentage of passengers traveling on the basis of monthly paid electronic cards. The total calculation of the flow of passengers is based on the sale of tickets based on the experience of foreign countries. The flow of passengers changes on rainy, cold, dry, low-humidity days and even on cloudless days. Even in unfavorable weather at night on weekends, the flow of passengers is significantly reduced. It is recommended to study the impact of the weather on public transport in two ways: absolute and relative. [5]

The absolute method involves changing the flow of passengers regardless of bus drivers. In a relative sense, the action associated with the impact of the weather on bus drivers is understood. Studies show that waiting times and the convenience of public transport places also affect the flow of passengers in adverse weather conditions. This will depend on the flow of passengers in public transport.

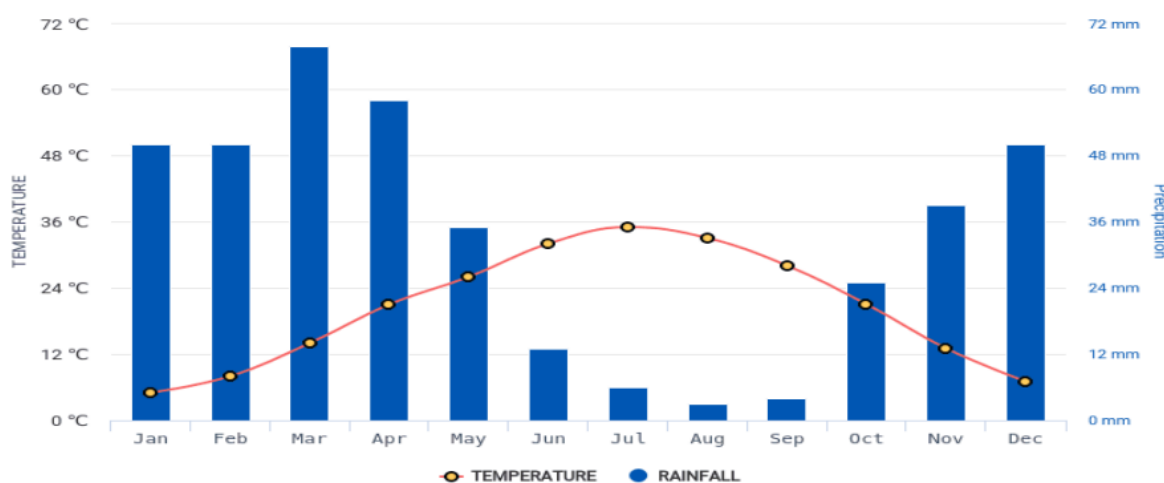


Figure 1. Andijan City temperature and precipitation totals

Temperature-temperature
Rainfall-precipitation indicator

According to the data hikersbay.com, Andijan's highest temperature for many years is in July, and its lowest temperature is in January. Analyzing the precipitation data, we can say that the most precipitation occurred in March, and the least in July. There were also organizers of meteorological indicators. There are also indicators such as atmospheric pressure, sunrise and sunset time and average wind speed [6].

The following is a review of the main factors affecting the urban public transport regime.

- daylight saving time (peak hours-usually 7:00 to 9:00 and 17:00 to 19:00, free time);
- season (Season, month);
- weekdays (weekdays and weekends);
- weather conditions (temperature, precipitation and humidity);
- weekends (school and college holidays, except holidays);
- holidays (January 1 - new year, March 8 - International Women's day, March 21 - Navruz, May 9 - Victory Day, September 1 - Independence Day, October 1 - teacher and teacher's day, December 8 - Constitution Day, Ramadan, etc.;
- major events (sports competitions, concerts, conferences, symposia);
- geosition-demographic and other indicators of the city and region:

Indicators of traffic flow in the Republic of Uzbekistan

Table №1

Years	2016	2017	2018	2019	2020	2021	2022	2023 ²⁾
Passengers transported, million passengers	4 909,9	5 169,9	5 380,0	5 560,4	5 679,0	5 951,5	6 025,1	5 240,4
Rail transport	17,4	19,1	20,1	20,5	21,1	22,1	22,9	6,2
Road Transport	4815,8 1)	5079,0 1)	5293,2 1)	5480,8 1)	5 591,3	5 852,8	5 915,2	5 192,9

1) identified data

2) preliminary data

According to the dynamics of passenger flow presented in Table 1, the share of road transport in the total passenger turnover of the country's transport system in 2016-2023 remained stable at the level of 95-99%. In 2016-2023, the increase in passenger flow in road transport averaged 4-6 percent each year.

We analyzed the impact of weather indicators on the flow of passengers in 2023 in relation to the number of passengers transported on buses belonging to the Alpomish heritage LLC bus park in Andijan. (Table 2)

Table No. 2

Weather averages for 2023 and number of passengers on bus fleet buses

Months	Ridership (Q)	Average weather temperature (t)	Humidity level (%)	Average soil temperature (t)	Precipitation (mm)	Snow cover (height cm)
January	817 173	5,6	61	3	74,5	3
February	804 373	5,7	61	5	30,6	6
March	885 662	12,9	56	13	47,1	0
April	922657	15,8	11,7	17	46,2	0
May	903 886	22,5	42	29	0,8	0
June	782 579	25,5	39	32	55,6	0
July	761 087	21,4	30	39	0	0
August	784 715	27,5	33	34	0	0

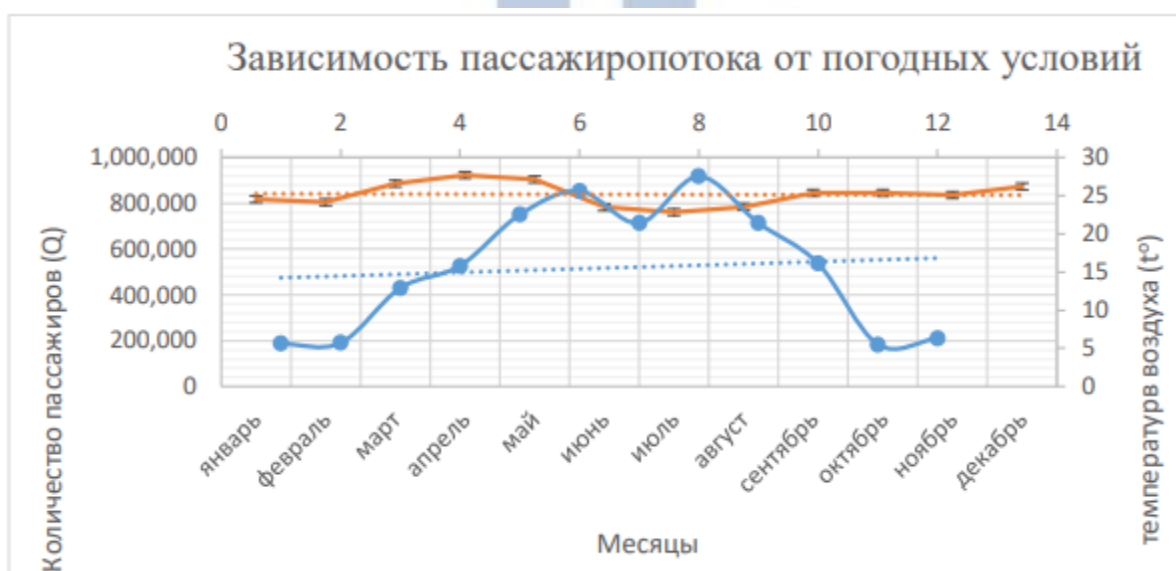


Photo: 2 passenger flow and average weather indicators

As a result of studying the effects of weather conditions on passenger flow, we have compiled Figure 2, which shows the degree of influence of weather change on passenger flow on bus routes carried out by Alpomish meirosi buses.

The highest temperature of the analyzed year was in July-August. As can be seen from this table, the lowest level of passenger flow corresponds to the highest months of temperature. Another factor affecting the flow of passengers is that schoolchildren and students are on vacation in July-August. The months of increased passenger flow are April and December. In December, we saw that the air temperature dropped to an average of -2, which in turn led to an increase in passenger flow at that time. According to a survey of passengers, at low temperatures and minuses, they use public transport more often than private transport.



Figure 3. Passenger flow and average humidity (%)

When studying the relationship between the average monthly flow of passengers and the humidity of the weather during the analysis (fig. 3) peak passenger flow was observed in April, when humidity levels were lowest.

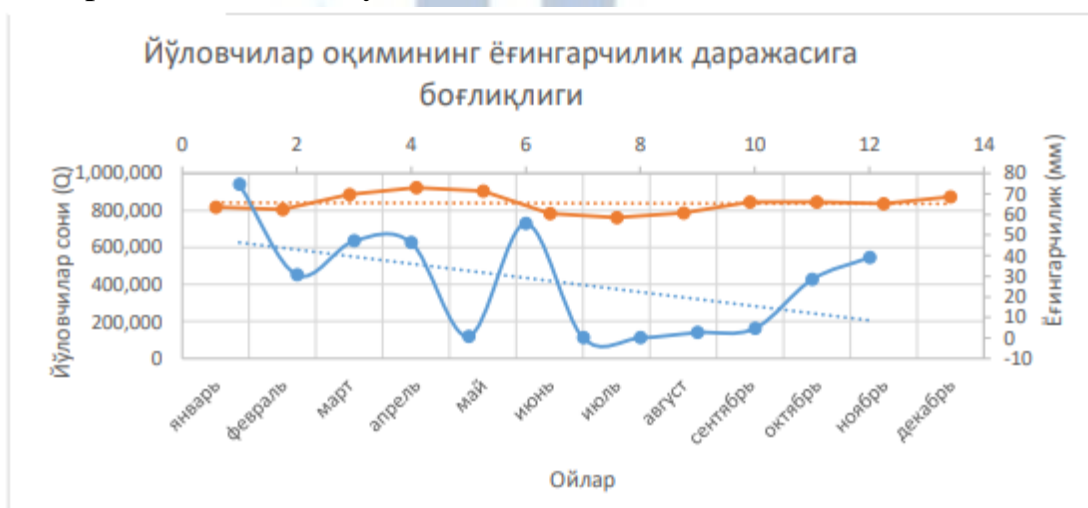


Figure 4. Average statistical indicators of the impact of precipitation (mm) on passenger flow

The minimum number of passengers recorded in July is August, when minimum precipitation is observed (fig. 4), and was also associated with periods of school and student holidays.

During the movement of public transport, weather conditions completely affect it. Therefore, the quality of public transport services also depends on weather conditions. The effect of weather indicators on the readiness of buses is manifested mainly during periods of low temperatures. Unfavorable weather conditions on the route lead to problems with a certain decrease in the speed of movement on a smooth road, deterioration of visibility in rain and fog, changes in passenger flow in rain and low temperatures, increased maneuverability of buses and increased traffic. These negative effects lead to an increase in the total travel time of public transport and a decrease in the quality of Service. 35-40% of the time of public transport on the route corresponds

to stopping (stopping) at intermediate stations. The Route time and the speed of communication change under the influence of the above indicators.

In conclusion, we note that the organization of public transport traffic without taking into account weather indicators negatively affects the time of movement of the bus along the route and the quality of Service. The study showed that not taking into account weather indicators in the public transport regime leads to a decrease in the quality of Service.

It is recommended to take into account such factors that affect the deviation of the bus traffic schedule from the plan in the development of the schedule. When developing a schedule, it is possible to take into account each of the weather indicators, provide an assortment of buses and increase the reliability of passenger service.

REFERENCES

1. Абдуллаев, У. (2023, March). ЎРТА ОСИЁ САКЛАРИГА ОИД ТАРИХИЙ-ЭТНОГРАФИК МАЪЛУМОТЛАР (манба ва адабиётлар тахлили). In *Proceedings of International Conference on Modern Science and Scientific Studies* (Vol. 2, No. 3, pp. 87-94).
2. Абдуллаев, У. С. (2023, March). ИЗ ИСТОРИИ ТРАДИЦИОННОГО МЕЖЭТНИЧЕСКОГО ВЗАИМООТНОШЕНИЯ НАСЕЛЕНИЯ ФЕРГАНСКОЙ ДОЛИНЫ. In *Proceedings of International Educators Conference* (Vol. 2, No. 3, pp. 14-20).
3. Абдуллаев, У. С., & Каримова, М. А. (2014). основные направления традиционных межэтнических процессов в ферганской долине (XIX-XX в. в). *Социально-гуманитарный вестник Юга России*, (4), 3-7.
4. Dilnoza, N. (2022). THE USE OF INTERACTIVE TECHNOLOGIES IN TEACHING PHILOSOPHY IN THE HIGHER EDUCATION SYSTEM. *Spectrum Journal of Innovation, Reforms and Development*, 4, 118-123.
5. Gulomjonovna, N. D. (2023). Spiritual and Economic Factors of a Strong Family. *Telematique*, 7607-7611.
6. Каримова, М. А., & Нажимидинова, Д. Ф. (2023). ФАРЗАНД ТУФИЛИШИ ВА БОЛА ТАРБИЯСИ БИЛАН БОҒЛИҚ УРФ-ОДАТЛАРДА ЗАРДУШТИЙЛИК ИЗЛАРИ. *Journal of new century innovations*, 12(1), 69-76.
7. Нажимидинова, Д. Ф. (2023). ОИЛА ТИНЧЛИГИ ЖАМИЯТ ФАРОВОНЛИГИ. *Journal of new century innovations*, 12(1), 77-81.
8. Якубова, Б. Б. (2019). Теоретические основы организации самостоятельной работы студентов. In *Психология в меняющемся мире: проблемы, гипотезы, исследования* (pp. 291-295).
9. Bakhtiyarovna, Y. B. (2021). A modern method of independent teaching the role of the distance education system information. *Berlin Studies Transnational Journal of Science and Humanities*, 1(1.5 Pedagogical sciences).
10. Khamidovna, P. O., Saidovna, R. D., & Bakhtiyarovna, Y. B. (2021). THE ROLE OF COMMUNICATION AND INDEPENDENT THINKING IN THE DEVELOPMENT OF STUDENTS' CREATIVE ABILITY. *Berlin Studies Transnational Journal of Science and Humanities*, 1(1.5 Pedagogical sciences).
11. Baxtiyorovna, Y. B. (2023, March). FORMATION OF INDEPENDENT THINKING AMONG YOUNG PEOPLE—TODAY IS THE MOST RELEVANT DAY IN PEDAGOGY AS A FUNCTION. In *Proceedings of International Conference on Modern Science and Scientific Studies* (Vol. 2, No. 3, pp. 143-148).
12. Якубова, Б. Б. (2019). Теоретические основы организации самостоятельной работы студентов. In *Психология в меняющемся мире: проблемы, гипотезы, исследования* (pp. 291-295).
13. Khamidovna, P. O., Saidovna, R. D., & Barnohon, Y. (2019). The Role of Interactive Methods For Improving Students Communicational Culture of Higher Educational Institutions. *International Journal of Scientific Research And Education*, 7(4).