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ОБЕСПЕЧЕНИЕ БЕЗОПАСНОСТИ ДОРОЖНОГО ДВИЖЕНИЯ И РЕГУЛИРОВАНИЕ ТРАНСПОРТНЫХ ПОТОКОВ НА ПЕРЕКРЁСТКЕ УЛИЦ И. КАРИМОВА И ГИРВОНСОЙ В ГОРОДЕ НАМАНГАН

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Аннотация. В статье рассматриваются вопросы регулирования транспортных потоков и обеспечения безопасности движения на пересечении улиц И. Каримова и Гирвонсой в городе Наманган. Проанализированы условия движения, система светофорного регулирования, пешеходные потоки и инфраструктура. Интенсивность и скорость движения оценены на основе полевых наблюдений и данных сервиса Yandex.Traffic. Эффективность светофорного цикла исследована с применением имитационного моделирования в PTV VISSIM. Определены основные причины заторов и предложены меры по их снижению за счёт оптимизации фаз и перераспределения потоков.

Ключевые слова. *транспортный поток, перекрёсток, светофорное регулирование, заторы, безопасность движения, имитационное моделирование, PTV VISSIM, Yandex.Traffic, пропускная способность, оптимизация фаз*

ENSURING TRAFFIC SAFETY AND REGULATING TRAFFIC FLOWS AT THE INTERSECTION OF I. KARIMOV AND G‘IRVONSOY STREETS IN NAMANGAN CITY

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Abstract. This article examines traffic flow regulation and road safety at the intersection of I. Karimov and Girvonsay streets in Namangan. Existing traffic conditions, signal control systems, pedestrian movement, and infrastructure were analyzed. Traffic intensity and speed were assessed using field observations and data from Yandex.Traffic. The effectiveness of signal timing was evaluated through simulation modeling in PTV VISSIM. The study identifies the main causes of congestion and proposes measures such as signal phase optimization and traffic redistribution to improve speed and reduce delays.

Keywords. *traffic flow, intersection, signal control, congestion, road safety, simulation modeling, PTV VISSIM, Yandex.Traffic, capacity, phase optimization*

Introduction. The selection of I. Karimov and Girvonsay streets is based on the fact that a large volume of vehicles traveling between different city districts passes through this intersection, which in turn leads to an increase in traffic flow and the formation of congestion. To obtain reliable data on the traffic conditions at the intersection of I. Karimov and Girvonsay streets in Namangan city, it is necessary to study traffic flows in the selected sections of the city.

The Main Part. A traffic signal control system based on T1-type traffic lights has been implemented at the intersection of I. Karimov and Girvonsay streets. I. Karimov Street consists of 3–4 traffic lanes, while Girvonsay Street has a carriageway width of 11.75 m and 7 m, respectively. At this intersection, at-grade pedestrian crossings, road signs 5.16.1/2 and 5.19.1/2, longitudinal road markings 1.14.1, and P1-type pedestrian traffic signals have been installed in accordance with GOST 32945–2014 requirements.

The traffic signal control operates on a four-phase vehicle cycle, while pedestrian movements are regulated by a two-phase system. Field observations confirmed that pedestrian crossings are conveniently located and safe, with no difficulties identified during crossing. No violations were found in the installation

of traffic control devices; however, the horizontal road markings are noticeably worn and require renewal.

The intersection is equipped with four T1-type traffic signals. Both I. Karimov and Girvonsay streets have four traffic lanes. At-grade pedestrian crossings, 5.19.1/2 traffic signs, four P1 pedestrian signals, and 1.14.1 road markings are applied at the site.

At the same time, congestion and reduced traffic speeds are observed at the intersection. The main cause of these issues is the complexity of left-turn maneuvers and the resulting conflict between traffic streams.

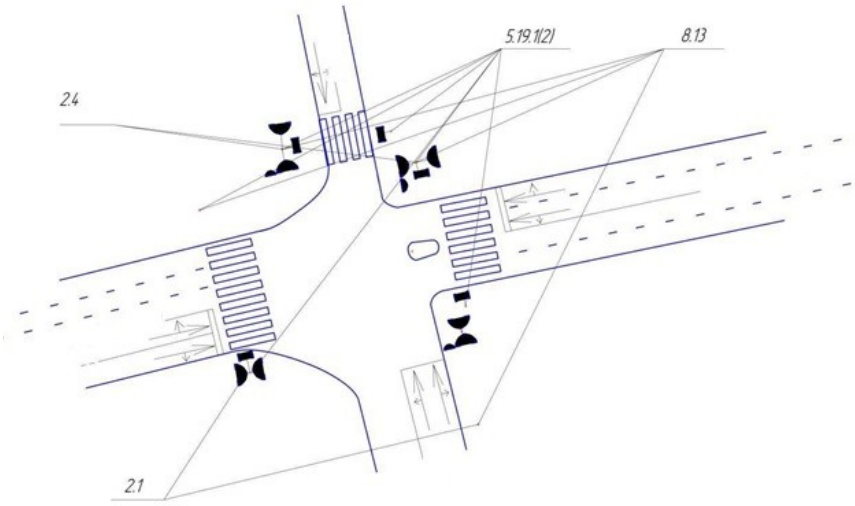

Figure 1. Traffic organization scheme at the intersection of I. Karimov and Girvonsay streets.

Methods. To reduce the increasing traffic load on the main arterial roads of Namangan city and improve their capacity, the development of the urban street network is considered necessary. The capacity of arterial streets is evaluated based on the following factors:

- geometric parameters (road width, number of lanes, longitudinal gradient, spacing and type of intersections);
- traffic organization (type of traffic control, traffic composition, parking facilities, pedestrian crossings, and condition of control devices);

- pavement condition, infrastructure, and lighting system (influencing visibility, safety, and travel speed).

In international practice, simulation-based software tools are widely used to assess factors affecting traffic flow. In particular, PTV VISSIM is applied to optimize traffic signal phases and reduce delays at intersections.

Improper design of traffic signal cycles leads to congestion and queue formation at intersections. Therefore, traffic optimization was analyzed by modifying phase durations. Traffic conditions were simulated before and after optimization (Figures 5–6).

Traffic speed was evaluated using a color-coded scale: red – up to 10 km/h, orange – up to 20 km/h, yellow – up to 30 km/h, dark green – up to 40 km/h, blue – up to 50 km/h, and light green – up to 60 km/h.

Speed variation analysis was carried out using data from Yandex.Traffic, which enabled the assessment of congestion conditions at the studied intersection.

Results. According to the color-coded speed classification, red represents speeds up to 15 km/h, while yellow corresponds to 15–25 km/h. Based on a one-week monitoring period, the average traffic speed at different times of the day at the intersection was evaluated. Figure 8 presents the weekly variation of traffic speeds during peak hours.

The analysis revealed that the most severe traffic conditions occur during the morning peak hours. According to data from Yandex.Traffic, the average speed during this period is approximately 26 km/h. The main contributing factor is the complexity of left-turn maneuvers on Girvonsay Street.

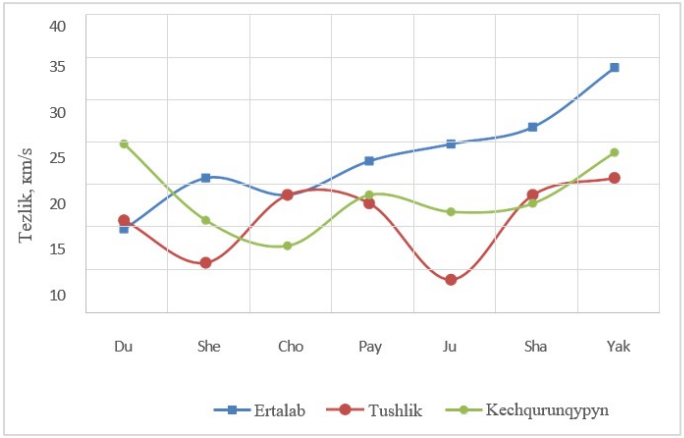

Figure 2. Variation of traffic speed at the intersection of I. Karimov Street and Girvonsay Street according to time of day and days of the week.

Additional analysis shows that congestion also intensifies during midday and evening peak hours, where the average speed decreases to about 18 km/h (Figures 9–10). This situation is associated with the low capacity of the intersection and delays caused by the four-phase traffic signal cycle.

Overall, the highest levels of congestion are observed during midday and evening peak hours, accompanied by a significant reduction in traffic speed.

Conclusion. The results of the conducted study indicate that the proposed measures for optimizing traffic flow at the intersection of I. Karimov and Girvonsay streets significantly reduce congestion levels and help prevent excessive delays in traffic movement.

In addition, the functional extension and reorganization of I. Karimov and Girvonsay streets within the urban transport network contribute to a more balanced redistribution of traffic flows, thereby improving mobility conditions and enhancing road traffic safety.

The effectiveness of the proposed organizational and technical solutions was evaluated through simulation modeling using PTV VISSIM. The obtained results confirm that the developed measures are effective in improving traffic flow stability, increasing intersection capacity, and enhancing overall traffic performance.

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