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INFLUENCE OF TRAFFIC LIGHTS ON BOBURSHOH STREET IN ANDIJAN CITY ON ECOLOGY AND FUEL CONSUMPTION

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ABSTRACT: This article analyzes the impact of traffic lights located on Al-Farg'oniy Street in Andijan on traffic flow, fuel consumption, and the environmental situation. During the study, the location of 12 traffic lights on this street, their operating hours, and traffic dynamics were examined. An average of 300 cars per hour have been recorded, and due to improperly adjusted traffic lights, vehicles are often forced to repeatedly stop and start
Keywords: Exhaust gases, automobile, internal combustion engine, tire treads, brake pads, environment,

As a result of the large number of vehicles, the amount of pollutants released into the atmosphere, such as SO2, NOx, CO, PM10, and PM2.5, is increasing. Throughout the year, emissions from cars lead to the deterioration of the city's air quality. In addition, the noise level for residents living near major roads and intersections may exceed normal standards [1-3].

Over the past decade, a significant increase has been observed in the entire vehicle fleet within the Andijan region. Growth indicators were analyzed based on data from the Andijan Regional Department of Internal Affairs, examining the total number of registered vehicles in the region by vehicle category. The number of registered vehicles in the Andijan region is presented in the following tables.

Currently, the number of vehicles in the Andijan region is also growing rapidly. Harmful gases emitted by vehicles (CO2, NOx, CO, PM, and others) are considered one of the main sources of environmental pollution.

A practical study was conducted on Bobursho Street in the city of Andijan, for which we collected data on road traffic flow. There are 12 traffic lights in the observation area. We observed the difference between the theoretical "green wave" where cars don't stop and the "red wave" when stopping at intersections, ranging from 1 to 12 stops. Thus, we assumed that traffic along the entire length of the observation route is consistent, which is certainly incorrect - traffic is sometimes heavy, sometimes light. Additionally, we assumed that the day we collected the data was a typical day, and therefore the data obtained are applicable to all days of the year, although we know this is not true for Sundays and holidays. Furthermore, we only studied the traffic flow in the north-south direction and did not account for traffic on the connecting roads. We aimed to indicate the environmental impact of increased fuel consumption at intersections in a specific direction on a given day [4,5].

Measurement results from a relatively small area (9.8 km of road) show significant differences in fuel consumption, which can amount to more than 1.5 million liters of fuel annually between the "green" and "red wave." This can be extrapolated to a larger urban area through appropriate multiplication.

Table 1

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Average acceleration times to 50 km/h at the required speed and distances covered during acceleration

Vehicle Type	**Average acceleration time from 0 to 50 km/h (sec)**	**Distance covered during acceleration (m)**
Cars	10.4	72
Light commercial vehicles (< 3.5t)	12	83
Medium-duty trucks (3.5t - 7t)	14	97
Heavy-duty trucks (over 7t)	16	111
Vehicles with trailers	18.5	128
Buses	15	104
Motorcycles	8.2	57

In our calculations, we did not account for multiple possible stops at the same intersection - we assumed that the vehicle passed through the intersection without stopping, although in practice this is not always the case. Often, at traffic lights and in traffic jams, vehicles accelerate and decelerate several times.

Research shows that traffic flow has an unexpectedly significant impact on fuel consumption and, consequently, also affects the amount of PM10 particles. On Bobursho Street in Andijan city, which spans 9.8 km and has 12 traffic lights, there are 12 possible traffic patterns for traveling this route. It can be concluded that in the best-case scenario, an average of 4,939 liters of fuel is consumed per day, while in the worst-case scenario, 22,219 liters are consumed. Of course, it is necessary to account for the damage caused by braking, tire wear, and general vehicle vibrations resulting from starting and stopping. In addition to the direct costs due to increased fuel consumption, we must also consider environmental pollution caused by increased noise and significant dispersion of CO_2 and PM_{10} particles (including $PM_{2.5}$ and PM_1). If traffic lights on Bobursho Street in Andijan city are managed rationally or a "green wave" system is implemented, it would be possible to save more than 17 thousand liters of fuel per day, which in turn would bring great benefits to both the environment and the economy.

Conclusion

Based on the data studied on Bobursho Street in Andijan city, it was determined that the number of traffic lights in this area and their operation directly affect the environmental situation and fuel consumption. As a result of frequent stops and re-starts of vehicles at traffic lights, fuel consumption is increasing, and more harmful gases are being released into the atmosphere - carbon dioxide (CO2), nitrogen oxides (NOx), hydrocarbons (HC), and other pollutants. This not only reduces fuel efficiency but also leads to air pollution. The analysis showed that traffic lights that are improperly adjusted or do not account for traffic flow are causing traffic congestion.

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This situation not only negatively affects road safety but also causes significant damage to the environment.

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