

Optimisation of Urban Passenger Transport through the Introduction of Environmentally Friendly Modes of Transport and the Adoption of a European Policy to Increase the Number of Cyclists to Improve the Environmental Situation in the Republic of Uzbekistan

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Abstract: The situation with air pollution in Tashkent raises concerns among experts of the World Health Organization. According to the IQAir company report for 2020, Tashkent ranks 18th in the list of the most polluted cities with an average annual concentration of PM2.5 particles (29.9 µg/m³) (News agency Podrobno.uz, <https://podrobno.uz>). Every day more and more cars drive on the streets of cities, which emit up to 90% of the total number of air pollutants (Газета.uz, <https://www.gazeta.uz>). In this article will be considered the solution to the problem of air pollution in large cities through the improvement of public transport systems (on the example of Tashkent).

1 INTRODUCTION

Atmospheric air pollution is one of the main environmental health problems that affects everyone in low, middle and high-income countries. This article presents the values and levels of air pollution in the Republic of Uzbekistan and in Tashkent city. An example of a successful European policy to reduce air pollution and ways to reduce pollution in sectors such as urban transport is proposed.

2 MATERIALS AND METHODS

Emissions of pollutants into the atmospheric air in Tashkent in 2018 amounted to 426 thousand tons. Motor vehicles accounted for 395,000 tonnes, or more than 90% of the emissions, the Tashkent City Department of Ecology and Environmental Protection said.

The level of urban air pollution is measured by the Atmospheric Pollution Index (API). An Atmospheric Pollution Index (API) of less than 5 points corresponds to a reduced level of pollution.

The MPA is calculated by comparing observed concentrations of pollutants with their maximum permissible concentrations (MPC), values above 1.0 are potentially hazardous to public health.

Over the past 10 years, all cities in Uzbekistan have had lower levels of air pollution, the Hydrometeorological Service Centre said. The lowest values of 1.10-2.63 are in cities such as Denau, Kokand, Gulistan, Samarkand and Sariasia. Higher values of the WAC - 4.30-5.30 are observed in Almalyk, Angren, Bukhara. In the rest of the cities, the WAC is in the range of 3.20-3.97 (Газета.uz, www.gazeta.uz).

Uzbekistan-wide, total emissions in 2018 amounted to 2,449,000 tonnes, of which road transport accounted for 60%, more than three times the standards set in developed and developing countries. And this was the message of the World Environment Day conference on 4 June 2019 (Газета.uz, www.gazeta.uz).

The main mobile source of pollutants, in particular nitrogen dioxide, is urban transport. More than 2 million vehicles are registered in the country, of which 450 thousand are registered in Tashkent.

The city receives about 50 thousand vehicles from other regions and countries every day.

About 75% of vehicles registered in the capital run on gasoline and diesel engines, and 25% run on gas. Diesel-powered vehicles emit 208 kg of pollutants per tonne of fuel, while gas-powered vehicles emit 3 times less, Tashgorekologiya said.

Motor vehicles emit 200 pollutants into the air, including carbon monoxide, aldehydes, soot and nitrogen oxides. When these substances accumulate in the ground layer (the breathing zone of people), under the influence of ultraviolet rays they react and become the initial products for the formation of new, sometimes even more toxic compounds.

Compared to 1991 (393 thousand tons) the volume of pollutant emissions from motor transport in Tashkent has almost not changed, although the emission rate per unit of motor transport has decreased many times from 2.62 tons to 0.88 tons per year. This was achieved in no small part by the renewal of buses and trucks.

In 2018-2019, Operation Clean Air, conducted by Tashgorekologiya, found that about 6 per cent of the capital's vehicles emit emissions with increased toxicity and smokiness.

Since 1 March 2007, Uzbekistan has banned the import of used passenger vehicles and medium-duty trucks and, since 1 January 2010, all vehicles whose engines do not meet the Euro 3 emission class, the UzStandart agency recalled.

According to 2019 Toshshahartranshizmat, the capital's bus fleet consists of 622 Euro-2 eco-standard buses. There are 572 Euro-3 buses and 131 Euro-5 buses.

Air pollution is a major environmental health risk factor. The lower the levels of air pollution, the better the cardiovascular and respiratory health of the population, both in the long and short term. In 2016, 91% of the world's population lived in areas where air pollution exceeded the World Health Organization (WHO) air quality guidelines. 91% of the world's population lived in areas where pollution levels exceeded the World Health Organization (WHO) air quality guidelines. In 2012, an estimated 4.2 million premature deaths occurred worldwide due to air pollution in urban peripheries and rural areas (Atmospheric air pollution, www.who.int).

Many sources of air pollution cannot be controlled by individuals and require consolidated action by authorities at local, national and regional levels in sectors such as transport.

Transition to clean ways of generating energy; prioritise high-speed urban transport, pedestrian and

cycling networks in cities, and intercity rail freight and passenger transport.

Currently, Tashkent is continuously developing public transport, optimising bus routes and constructing new metro stations. In 2020, 14 metro stations have been commissioned and new Moscow series cars (81-765/66/67) have been purchased.

The underground is a fairly convenient and fast mode of rail transport, allowing to relieve a lot of bus lines. However, the construction of new underground lines is quite expensive, time-consuming, and resource-intensive. Also, designing underground lines to each house is not possible, due to the complexity and high cost of construction. As for the buses, their capacity is often not sufficient to meet passenger needs. One alternative to these modes of transport could be the tramway.

The tram is a modern mode of transport that can improve the city's transport and environmental situation as well as boost the city's economic statistics.

The tram has the following advantages (Ambient air quality and health, www.who.int):

- Before railless modes of transport:
 - higher capacity of trains compared to other modes of transport (140 passengers in single section trams, compared to 90-100 seats in large class buses, 4-7 seats in cars);
 - cheaper operating costs compared to buses. The cost of liquid fuels is higher than electricity, and the simplicity and maintenance of electric motors makes maintenance of electric vehicles cheaper;
 - better dynamic performance, allowing for smoother acceleration and braking, resulting in a more comfortable ride for the passengers;
 - traffic on the segregated roadway can minimise the time spent in congestion and traffic jams;
 - the possibility of coupling tram cars into trains (multi unit system, hereinafter referred to as CMU), allows increasing the line capacity, without additional labour resources;
 - the consistency of the clearance and the absence of buffer zones, allows the line to pass in small places where a trolleybus, or a bus, would not be able to pass;
 - trams are the safest. Trams are involved in 40 times fewer accidents than buses and 140 times fewer passenger cars;
 - the tram has a longer depreciation period than tyre vehicles;

- world practice shows that former car drivers are more likely to choose rail than non-rail modes of transport;
- the presence of a tram line in the street makes drivers more attentive and disciplined, as they are forced to keep their eyes on the tram;
- The tram is an environmentally friendly mode of transport, unlike the bus, which does not pollute the air;
- the tram has shorter intervals (up to 10 minutes) than the bus;
- the tram has a high routing factor, due to the low need for interchanges.
- Before the underground:
 - Lower cost of operation compared to the underground, due to the minimal need to build trestles and dig tunnels, as well as the cost of buying new trains or rebuilding existing ones;
 - Significantly lower initial costs, when building an express tramway, based on a well-developed and well-equipped tramway system;
 - possibility of running the tram line directly along the street and in some cases on a shared roadway;
 - the possibility of a gradual commissioning of the line. The length of the express tramway line can increase and change. The underground line is only commissioned after all the works have been completed;
 - shorter approach distance to the station, which is undoubtedly important for passengers.

The main characteristic technical and economic indicator of an express tramway is its communication speed, which depends on the maximum possible travel speed along a section of track, the probability of interference and the distance between stops.

The carrying capacity of the tramway depends on the frequency and capacity of the trains.

Tramways and other modes of rail-based urban transport offer a number of significant environmental and economic advantages, which have already been recognised in many foreign countries.

European countries adopted the Vienna Declaration on Clean, Safe and Healthy Transport on 18 May 2020 and the first ever Pan-European Master Plan for Promoting Cycling, the European Office of the World Health Organization (WHO) said. (Vuzlit, <https://vuzlit.ru>)

The master plan includes measures such as:

- doubling the prevalence of cycling in the region by 2030;
- a significant increase in cycling and walking in every country;
- the redistribution of cycling and walking areas;
- improving the infrastructure for active travel in each country;
- improving the safety of cyclists and pedestrians;
- developing national cycling policies, strategies and plans;
- Integrating cycling issues into health policies, infrastructure planning and land use plans.

In a region where non-communicable diseases, including cancer, diabetes, cardiovascular and respiratory diseases, account for an appalling 70% of all deaths, transport and urban policies significantly affect health, and often not in a good way.

There is interdependence between the environment and human health and active travel should be promoted in order to prevent non-communicable diseases and reduce air pollution, which kills over half a million people every year.

3 RESULTS AND DISCUSSIONS

The plan will also reduce greenhouse gas emissions by eight million tonnes, relieve traffic congestion and use urban space more efficiently. It takes eight times less space to park a bicycle than to park a car. The ECE has estimated that the economic benefits from reducing traffic congestion alone would be about \$4.9 billion.

4 CONCLUSION

In this article, we have explored options for solving the pollution of Uzbekistan's atmosphere by improving the public transport system and making it safer and more comfortable for pedestrians and cyclists to use. These ideas have already been successfully implemented in many European cities and can also be applied in the capital of Uzbekistan.

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