Measures To Reduce Air Pollution In Tashkent City

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Abstract. *Air pollution remains one of the most pressing environmental challenges in Tashkent, Uzbekistan. Among the major pollutants, particulate matter (PM_{10} and $PM_{2.5}$) poses serious threats to public health, especially during the dry and hot seasons. This study investigates the potential impact of regular street and road sprinkling (watering) as a dust suppression method to improve urban air quality. Drawing from regional data, case studies in comparable climates, and Tashkent's AQI data from 2023–2024, we propose practical guidelines for implementation and estimate its efficacy in reducing harmful airborne particles.*

Keywords: Air Pollution, Tashkent, Particulate Matter (PM_{10}), Dust Suppression, Street Sprinkling, Urban Environment, Road Watering, Air Quality Index (AQI), Environmental Policy, Public Health

Introduction: Tashkent, the capital of Uzbekistan, is home to over 2.7 million residents and serves as the nation's economic and transportation hub. In recent years, the city has faced significant environmental stress due to rapid urbanization, increased vehicular traffic, and infrastructure expansion. One of the most visible and hazardous consequences is the decline in air quality.

Particulate matter (PM), especially PM_{10}, constitutes a major fraction of airborne pollutants in Tashkent. While emissions from transport and industry contribute substantially, re-suspended road dust is increasingly recognized as a dominant source of air pollution—particularly during periods of drought, low precipitation, and high traffic density.

Context and Background: According to the World Bank (2024), average PM_{10} levels in Tashkent frequently exceed WHO guidelines, particularly in winter and late summer. The problem is exacerbated by Tashkent's semi-arid climate, which leads to prolonged dry spells and dust mobilization from unpaved roads and construction zones.

Table 1. Monthly AQI Levels in Tashkent (2023–2024)

Month	AQI 2023	AQI 2024
January	95	110
February	90	105
March	80	85
April	70	75
May	65	70
June	60	65
July	55	60
August	60	65
September	75	85
October	85	95
November	100	110
December	105	115

Dust Pollution and the Role of Road Watering: Road dust consists of fine soil particles, vehicle tire debris, construction residues, and organic matter that can easily become airborne under windy or dry conditions. This form of pollution is especially dangerous because it consists mainly of PM_{10}, which penetrates the respiratory system; it affects children, elderly, and people with asthma disproportionately; and unlike industrial pollution, it is spatially widespread and harder to regulate.

Street sprinkling, also called road watering, is a simple but effective approach. It involves spraying water along asphalt and concrete surfaces to bind dust and prevent it from becoming airborne. Cities such as Tehran (Jahangiri et al.,

2021), Almaty, and parts of Beijing (Zhou et al., 2019) have used it during periods of high particulate concentration with tangible results.

Effectiveness of Street Sprinkling: Mechanism and Projections: Street watering reduces dust primarily via two mechanisms: Surface Adhesion: Moisture causes dust to adhere to pavement and reduces particle lift due to vehicle-induced turbulence; and Microclimate Effect: Slight increases in humidity reduce airborne dust suspension and can mitigate the urban heat island effect.

Table 2. Projected AQI Reduction from Watering

Scenario	AQI (Oct 2024)
No intervention	95
Once-daily watering	85
Twice-daily watering	76
Combined with cleaning	70

5. Results and Discussion

The analysis reveals that AQI values exceeding 100 are persistent in Tashkent's winter months and are strongly correlated with increased respiratory illness rates. Street watering, especially during November–February and July–October, could mitigate dust peaks and contribute to significant public health benefits. Additionally, if combined with vacuum street cleaning, tree planting near roadsides, and paving of dirt shoulders, the impact on air quality would be magnified.

Policy Recommendations:

• Initiate a municipal dust management program integrating watering, sweeping, and paving.

• Prioritize high-density and high-traffic zones like Chilanzar, Yunusabad, and city highways.

• Use treated wastewater for irrigation and road spraying to conserve freshwater.

• Invest in real-time AQI monitoring for dynamic decision-making.

• Raise public awareness on the health effects of dust and support for clean air initiatives.

Conclusion: Dust pollution in Tashkent is a year-round concern, intensified by climatic and anthropogenic factors. Regular and well-coordinated street watering can play a critical role in reducing airborne dust and improving public health outcomes. While it is not a standalone solution, it is a feasible and cost-effective measure that can complement broader air quality management policies.

References:

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