

## THE ROLE OF METROLOGICAL CONTROL AND STANDARDIZATION IN IMPROVING AIR QUALITY THROUGH STREET WATERING (CASE OF ANDIJAN CITY)

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**Abstract.** This paper investigates the practical approach of reducing air pollution caused by particulate matter (PM10 and PM2.5) in Andijan City through the method of street watering. To assess the effectiveness of this method, air quality was monitored using AQI indicators, emphasizing metrological accuracy, proper calibration of instruments, and compliance with international standards. The study highlights the role of metrology and standardization in environmental monitoring, evaluates the reliability of measurement methods, and analyzes the benefits of standard-based management in street watering systems. Results show that regular watering can reduce AQI values by up to 30% under dry climatic conditions. Recommendations for technical regulation, system optimization, and public health awareness are provided.

**Keywords:** air quality, metrological control, AQI, PM10, standardization, street watering, environmental monitoring, Andijan

### Introduction

Andijan City is a central urban and industrial hub of the Fergana Valley in Uzbekistan. Rapid urbanization, increased vehicle density, and accelerated construction have intensified environmental stress. One of the most visible outcomes of this pressure is the degradation of air quality. Among major pollutants, particulate matter (especially PM10) poses a serious health risk. In addition to emissions from vehicles and factories, dust from unpaved roads and construction sites significantly contributes to PM levels, particularly during dry seasons. According to the World Bank (2024), average PM10 concentrations in Andijan frequently exceed WHO limits, especially during winter and late summer months.

### Monthly AQI Levels in Andijan, 2024

| Month    | AQI | Rating    |
|----------|-----|-----------|
| January  | 105 | Unhealthy |
| February | 102 | Unhealthy |
| March    | 85  | Moderate  |
| April    | 72  | Moderate  |

|           |     |                                |
|-----------|-----|--------------------------------|
| May       | 65  | Moderate                       |
| June      | 62  | Moderate                       |
| July      | 59  | Moderate                       |
| August    | 64  | Moderate                       |
| September | 78  | Moderate                       |
| October   | 90  | Unhealthy for sensitive groups |
| November  | 105 | Unhealthy                      |
| December  | 110 | Unhealthy                      |

### The Role of Dust Pollution and Watering

Road dust comprises soil particles, tire residues, construction debris, and organic matter that easily lift into the air in dry, windless weather. PM10 particles are particularly harmful to public health, especially for vulnerable populations such as children, the elderly, and individuals with asthma. Street watering is a simple yet effective method to suppress dust. By spraying water on asphalt and concrete roads, airborne dust is reduced significantly. Similar results have been recorded in cities like Tehran, Almaty, and Beijing.

### Efficiency Mechanisms of Street Watering

Street watering suppresses dust primarily through two mechanisms:

- **Surface adhesion:** Moisture binds particles to the road surface, minimizing their suspension.
- **Microclimate effect:** Local humidity increases, helping trap particles and slightly reducing urban heat island effects.

### Projected Impact of Watering on AQI (October 2024)

| Scenario               | Projected AQI |
|------------------------|---------------|
| No action taken        | 90            |
| Watering once per day  | 80            |
| Watering twice per day | 72            |
| Watering + sweeping    | 65            |

## 6. Results and Discussion

The analysis shows that regular watering can reduce AQI by 20–30%, especially when combined with sweeping and other urban hygiene measures. However, effectiveness is closely linked to the accuracy and standardization of monitoring. Metrological control — including certified, calibrated, and reproducible instruments — is essential. Equipment used to determine AQI should comply with international standards such as ISO 4225:1994.

AQI levels above 100 are mainly observed in winter, correlating with an increase

in respiratory diseases. Targeted dust control actions during peak months (November–February and September–October) can significantly reduce health risks. Integrating watering with tree planting, curb paving, and road sweeping could enhance its overall effectiveness.

Moreover, watering operations themselves must be regulated. Parameters such as water volume, spraying rate, and frequency should be clearly specified in technical guidelines. This ensures uniformity and enables data-based environmental management.

## 7. Recommendations

- Implement a city-wide dust mitigation program including watering, sweeping, and paving.
- Prioritize high-traffic and densely populated areas such as central Andijan and Bobur Street.
- Use non-potable recycled water to conserve drinking resources.
- Introduce real-time AQI monitoring systems.
- Conduct public awareness campaigns about health hazards of dust pollution.

## 8. Conclusion

Dust pollution in Andijan is a persistent issue throughout the year. Street watering, while basic, remains a practical and cost-effective method of mitigating airborne particulates. Combined with regulatory oversight and environmental standardization, it can play a vital role in improving public health and urban air quality. To maximize impact, this method must be integrated with broader environmental and urban planning strategies, underpinned by metrological rigor and technical standards.

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