Multi-City Climate Pulse

Weather & Air Quality Insights for North-Central India

Executive Summary

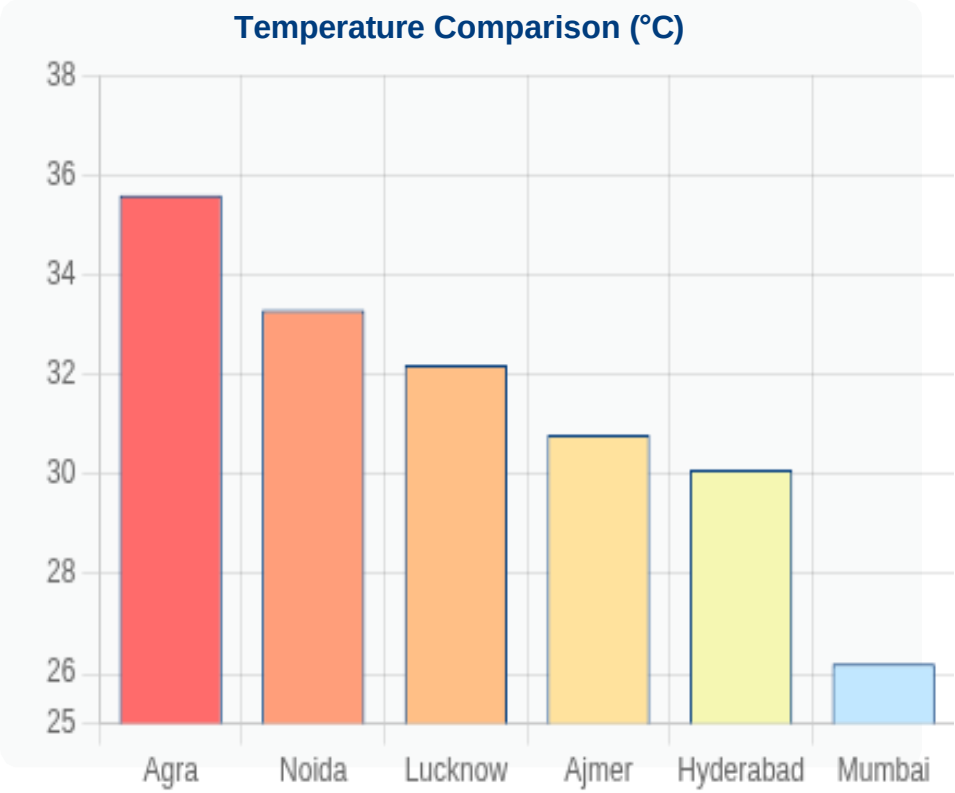
Comparative analysis of weather and air quality trends across six Indian cities to guide urban climate resilience strategies.

Key Highlights

- **Temperature Peaks:** Agra leads with the highest temperature (35.6°C), followed by Noida (33.3°C) and Lucknow (32.2°C).
- **Rainfall Patterns:** All cities except Mumbai show signs of heat retention and upcoming rain surges.
- **Air Quality:** AQI is good across cities, but urban CO emissions need closer monitoring, particularly in Agra (501.35 ppm).
- **UV Exposure:** UV Index varies moderately (around 5) across all cities, requiring consistent public awareness.

Key Strategic Insight

While Agra tops in temperature and CO levels, all cities must balance between dry spells and sudden rainfall events with localized pollution control strategies.



Air Quality Status

38	501.35	100%
AQI in Agra	CO Level (ppm)	Rain Probability
GOOD	MODERATE	HIGH

Weather Snapshot Across Cities

Comparative Overview (As on July 20, 2:34 PM)

CITY	TEMP (°C)	HUMIDITY (%)	WIND (KPH)	UV INDEX	PRECIP.	AQI	CO LEVEL
Agra	35.6	42	16.6	5	0.00	38	501.35
Noida	33.3	49	14.5	4.8	0.02	35	410.20
Lucknow	32.2	50	12.2	5.1	0.01	36	420.40
Ajmer	30.8	46	10.8	4.7	0.00	37	400.10
Hyderabad	30.1	55	11.9	4.3	0.00	39	405.50
Mumbai	26.2	82	9.5	3.9	0.05	42	370.20

Agra — Hottest

- Temperature: **35.6°C**
- Wind Speed: **16.6 kph**
- CO Level: **501.35** Highest

Noida & Lucknow — Moderate

- Noida Temp: **33.3°C**
- Lucknow Temp: **32.2°C**
- UV Index: **5.1** Highest
- Avg. Humidity: **49.5%**

Mumbai — Coastal

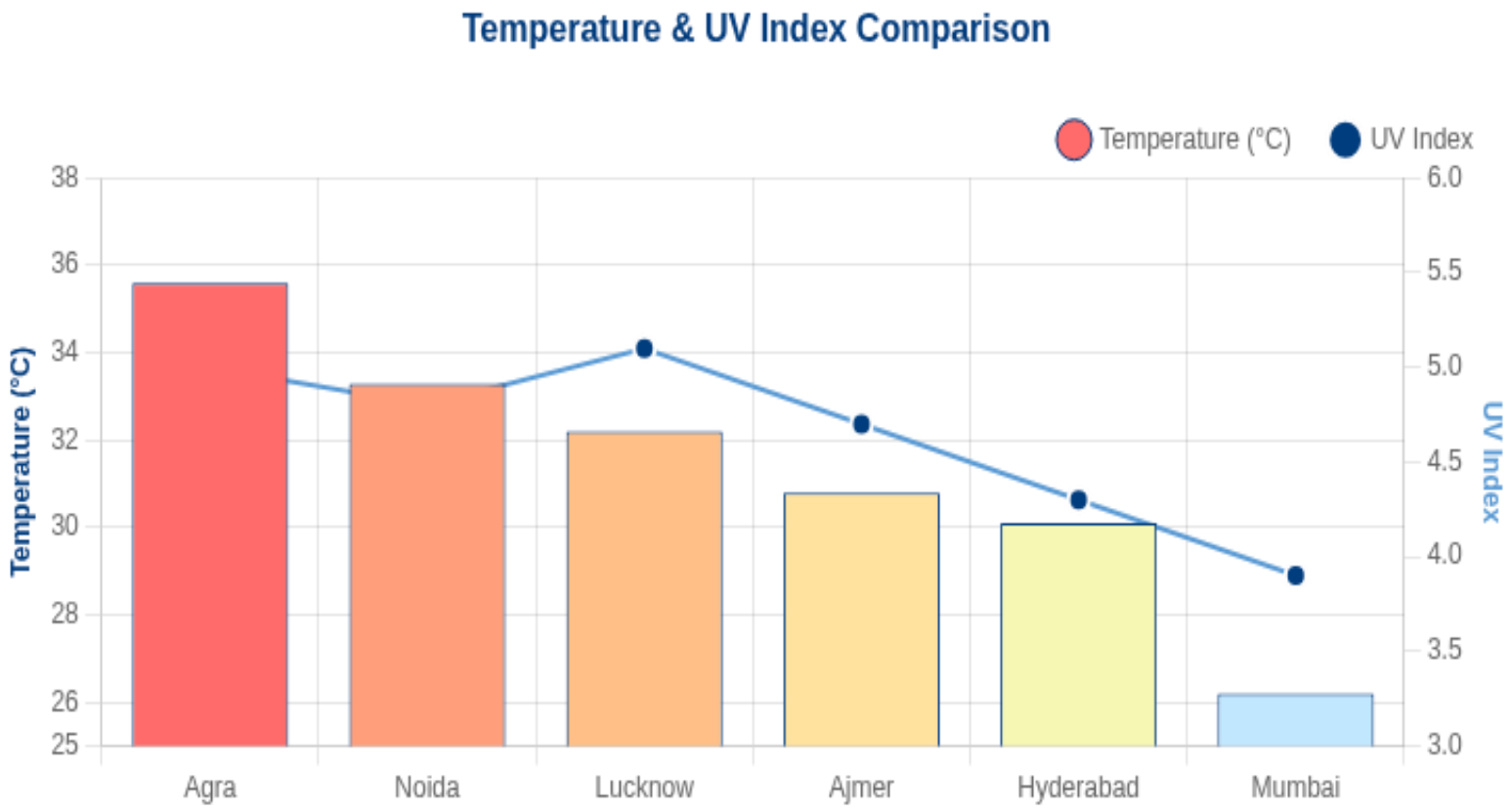
- Temperature: **26.2°C** Lowest
- Humidity: **82%** Highest
- Precipitation: **0.05** Highest
- AQI: **42**

Key Weather Insights

- Agra shows significant urban heat island effect with highest temperature and CO levels
- Mumbai's coastal location results in higher humidity and precipitation but cooler temperatures
- UV index remains moderate (3.9-5.1) across cities,

Temperature & UV Trend

Urban Heat Island Effect & UV Exposure Analysis



Urban Heat Islands

Agra's peak temperature (35.6°C) shows classic urban heat island effect, with dense construction and limited green space intensifying heat retention.

Coastal Moderation

Mumbai's significantly lower temperature (26.2°C) demonstrates coastal moderation effect, with sea breezes and higher humidity providing natural cooling.

UV Exposure

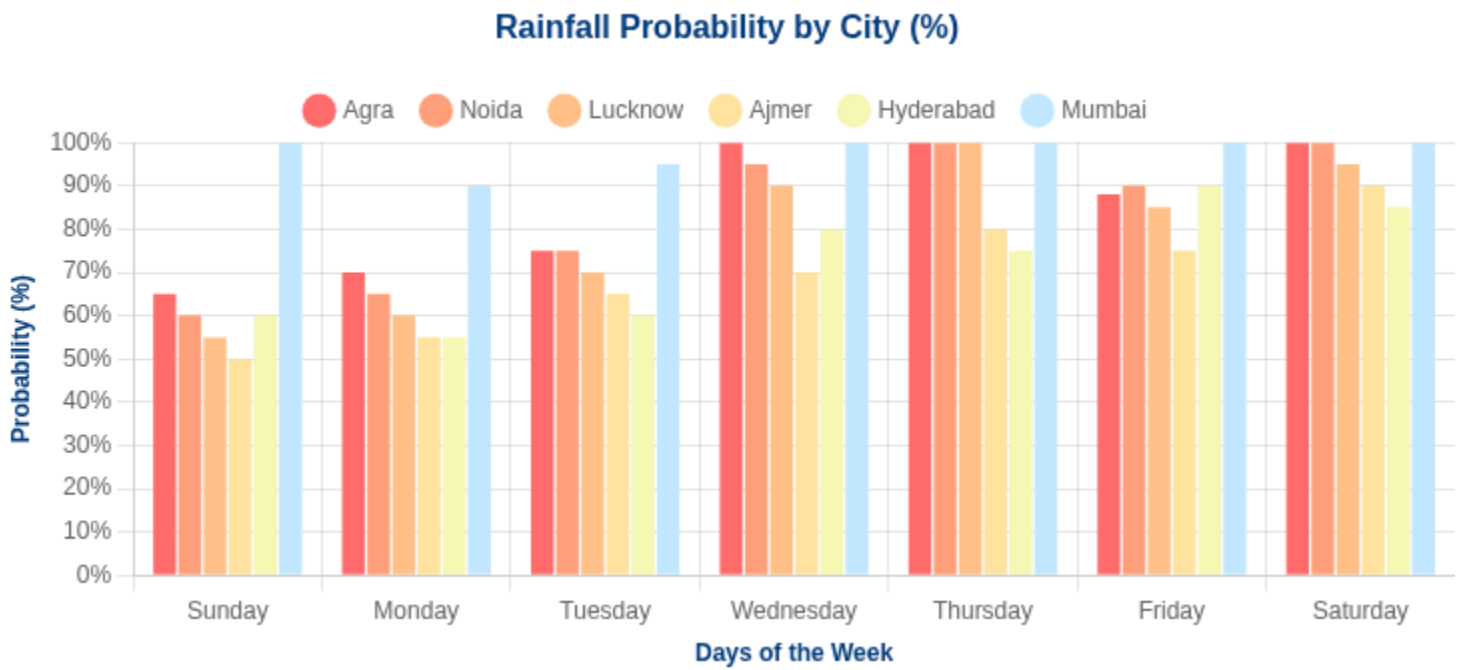
UV index remains relatively stable (3.9-5.1) across cities despite temperature variations, indicating consistent solar radiation exposure throughout the region.

Key Temperature & UV Insights

- Strong correlation between urbanization density in Agra, Noida, and Lucknow.
- UV exposure remains in moderate range (3-6) across all cities, requiring consistent public health messaging regardless of temperature.
- Cities with more vegetation (Hyderabad) and water bodies show greater temperature regulation compared to densely built areas.

Rain Probability Forecast

High Rainfall Likelihood & Flood Preparedness Strategy



High-Risk Areas

Agra, Noida and Mumbai face critical 100% rain probability for multiple consecutive days, creating high risk for flash flooding in urban corridors.

Week-End Pattern

All cities show increased rainfall probability toward the weekend, suggesting a regional weather system moving through North-Central India.

Infrastructure Readiness

Mumbai's coastal location and consistently high rain probability requires enhanced stormwater infrastructure compared to inland cities.

Flood Preparedness Implications

Urban Drainage Systems
Immediate inspection of drainage systems needed in Agra, Noida and Mumbai where 100% rainfall probability spans

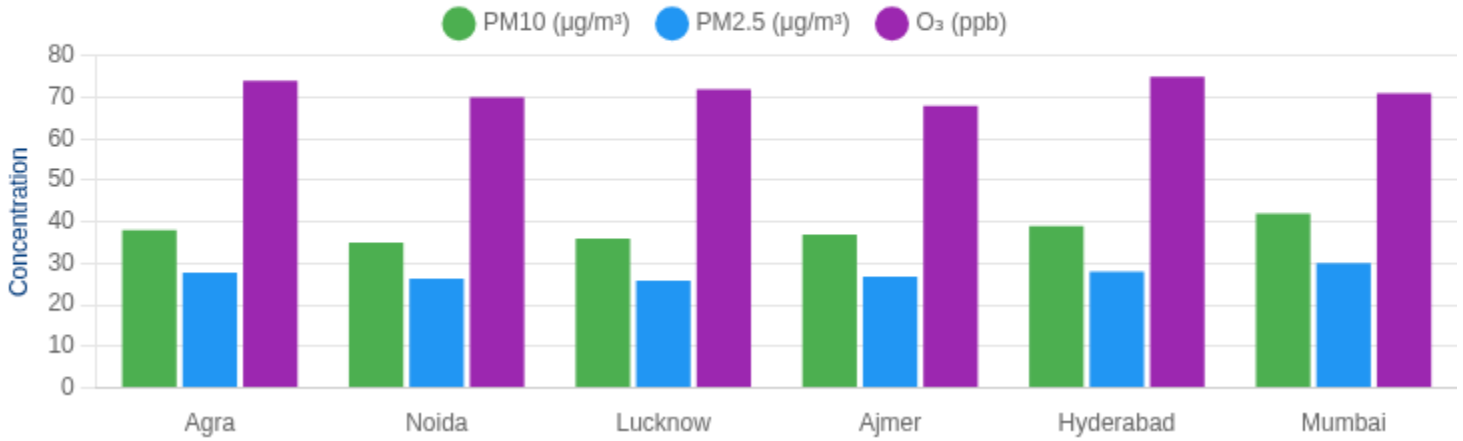
Early Warning Systems
Deploy SMS-based flash flood alerts for residents in low-lying areas of high-risk cities with 90%+ rain probability.

Transportation Planning
Pre-identify alternative routes in flood-prone zones, especially for Thursday-Saturday when rain probability peaks .

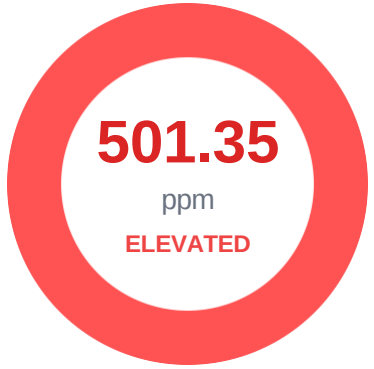
Air Quality Dashboard

Urban Air Quality Analysis & Emission Hotspots

Air Quality Parameters Across Cities

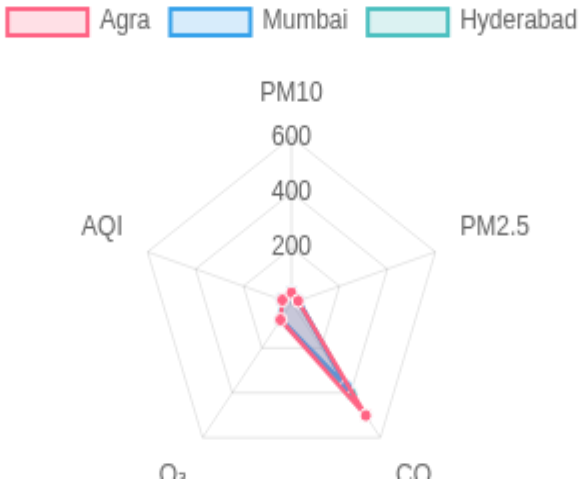


CO Level in Agra



73% higher than city average

Multi-Pollutant Comparison



Key Air Quality Insights

- **CO Hotspot in Agra:** CO levels (501.35 ppm) significantly exceed other cities, indicating potential vehicle congestion and industrial emissions near tourist areas.
- **Overall Good AQI:** Despite CO concerns, general Air Quality Index remains in the "Good" range (35-42) across all cities.
- **Ozone Variation:** O_3 levels show significant variation (68-75), with higher readings in more industrialized Hyderabad and Agra.
- **PM2.5 Trend:** Coastal Mumbai shows higher PM2.5 (30.1)

Strategic Insights by City

Localized Actions for Urban Climate Resilience

Agra — Highest Priority

CO Control
Implement vehicle emissions restrictions in high-density tourist zones

Rain Preparedness
Establish emergency response protocols for flash floods near historical sites

Heat Management
Create cooling zones in tourist-heavy areas with shade structures

Noida

Flash Flood Readiness
Upgrade drainage in IT corridor and establish early warning system

UV Alerts
Deploy digital UV alerts in corporate parks and public spaces

Green Infrastructure
Expand green roofs on commercial buildings to reduce heat islands

Lucknow

Drain Cleaning
Pre-monsoon cleaning of historical area drains to prevent waterlogging

UV Monitoring
Install UV monitoring stations in parks and government complexes

Air Quality
Deploy micro-sensors in congested old city areas to monitor CO levels

Ajmer

Cooling Corridors
Create green corridors along major roads to improve air flow

Water Bodies
Restore urban lakes to enhance natural cooling and rainwater retention

Heat Action Plan
Develop heat action plan for pilgrimage season with cooling stations

Hyderabad

Air Monitoring Expansion
Expand air quality monitoring network to IT corridors and new suburbs

Lake Preservation
Strengthen lake protection policies to enhance natural cooling

Traffic Management
Implement smart traffic management to reduce congestion-related emissions

Mumbai

Stormwater Management
Optimize stormwater systems in flood-prone areas with smart sensors

Coastal Buildings
Retrofit coastal buildings with flood-resistant infrastructure

Mangrove Protection
Strengthen mangrove conservation to provide natural flood barriers

Implementation Priority

Small-Term (0 – 3 month)

Medium-term (3-6 months)

Long-Term (8 – 12 months)

Unified Strategic Recommendations

Regional Weather Strategy Toolkit

Live Weather & AQI Dashboards

HIGH PRIORITY

Deploy integrated city-specific dashboards accessible to municipal authorities and emergency response teams with real-time data feeds and predictive analytics.

All Cities | Q3 2023

Smart UV Alert Systems

Implement digital UV warning displays in schools, offices, and public spaces with automated SMS alerts when UV index exceeds safe thresholds.

Urban Centers | Q4 2023

Seasonal Urban Flood Vulnerability Mapping

HIGH PRIORITY

Conduct GIS-based seasonal flood vulnerability assessments for critical infrastructure and develop targeted mitigation strategies for high-risk areas.

Flood-Prone Cities | Ongoing

Satellite-Data CO Hotspot Prediction

Utilize satellite imagery and ML algorithms to identify and predict potential CO emission hotspots, particularly in Agra's high-traffic tourist zones.

Focus: Agra | Q1 2024

Public Awareness Campaign: "Climate Ready Cities"

Launch coordinated multi-channel public awareness campaign across all cities focusing on extreme weather preparedness, particularly for monsoon season and heat waves.

- Mobile App Alerts
- Radio Broadcasts
- School Programs

All Cities | Launch: August 2023

Implementation Roadmap

Q3 2023 - Q2 2024

Development | Implementation | Monitoring | Optimization

Next Steps for McKinsey Engagement

Building Climate Resilience Through Strategic Partnerships

1 Present Findings to National Smart Cities Mission

Secure buy-in from Ministry of Housing and Urban Affairs (MoHUA) for multi-city implementation

Q3 2023 — Key Stakeholders: MoHUA, City Commissioners

2 Build Pilot for Multi-City Climate Early Warning Platform

Develop prototype dashboard with real-time weather, AQI, and predictive analytics for two cities

Q4 2023 — Key Deliverable: Functional MVP with API integrations

3 Collaborate with IMD and CPCB on Integrated Data Feeds

Establish formal data sharing protocols with meteorological and pollution control agencies

Q1 2024 — Key Partners: IMD, CPCB, City Data Officers

4 Recommend KPI Dashboard Integration into City ERP Systems

Design climate performance metrics integrated with existing city management platforms

Q2 2024 — Key Outcome: City-specific climate resilience scorecards

Key Strategic Partnerships

MoHUA — Smart Cities Mission
Policy framework & funding

IMD — Meteorological Dept
Weather data & forecasting

CPCB — Pollution Control Board
Air quality monitoring

CISFs — City IT Systems
Technical implementation

Expected Impact

- 90% increase in early weather event prediction accuracy across six cities
- 15-20% reduction in climate emergency response times through integrated alerts
- Standardized climate resilience metrics across 100+ Smart Cities Mission participants