

## How AI-IoT Integration Improves Urban Sustainability

- **Real-Time Traffic Optimization** AI algorithms analyse data from IoT sensors (e.g., cameras, GPS, inductive loops) to dynamically adjust traffic signals, reroute vehicles, and reduce congestion. This leads to:
  - Lower fuel consumption
  - Reduced greenhouse gas emissions
  - Improved air quality
- **Predictive Maintenance & Infrastructure Efficiency** IoT devices monitor road conditions and vehicle flow, while AI predicts wear-and-tear or potential failures. This proactive approach minimizes resource waste and extends infrastructure lifespan.
- **Enhanced Public Transport Coordination** AI uses IoT data to synchronize buses, trains, and shared mobility services, encouraging modal shifts away from private vehicles key to sustainable urban mobility.
- **Data-Driven Urban Planning** Long-term traffic data helps city planners design low-emission zones, pedestrian-friendly layouts, and smart parking systems, aligning with SDG goals.

## Two Key Challenges

### 1. Data Security & Privacy

- IoT sensors collect vast amounts of sensitive data (e.g., vehicle IDs, location patterns).
- Without robust encryption and governance, systems are vulnerable to breaches, surveillance misuse, and ethical concerns.
- AI models trained on biased or unprotected data can amplify risks.

### 2. Infrastructure Scalability & Interoperability

- Many cities rely on legacy systems that struggle to integrate with modern AI-IoT frameworks.
- Diverse vendors and protocols lead to fragmented data silos.
- Scaling edge computing and real-time analytics across city-wide networks demands high investment and technical coordination.