European University

MADRID JUNE 2025

GENIUS

Group 2

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İSTANBUL TEKNİK ÜNİVERSİTESİ 1773

MŰEGYETEM 1782

UNIVERSIDAD POLITECNICA MADRID

UNIVERSITATEA POLITEHNICA DIN BUCUREȘTI UPB 1818

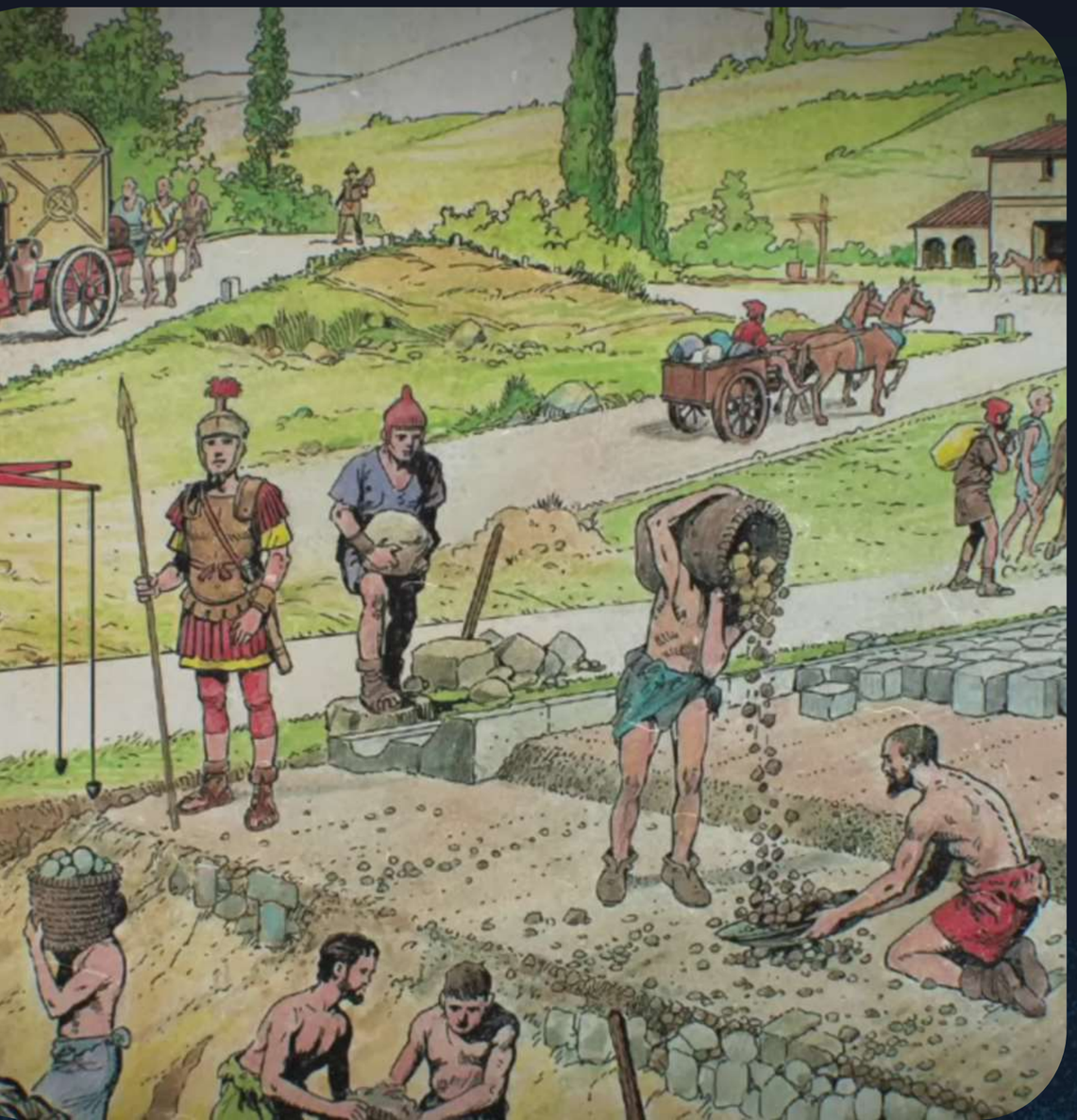
Agenda

1. Introduction
2. Debates
3. Conclusion

1 Introduction

The Strategic Imperative of Urban Intelligence

1 2 3



Romanic Urbanism

Affordability

LAVASA, INDIA

SURVIVORSHIP BIAS

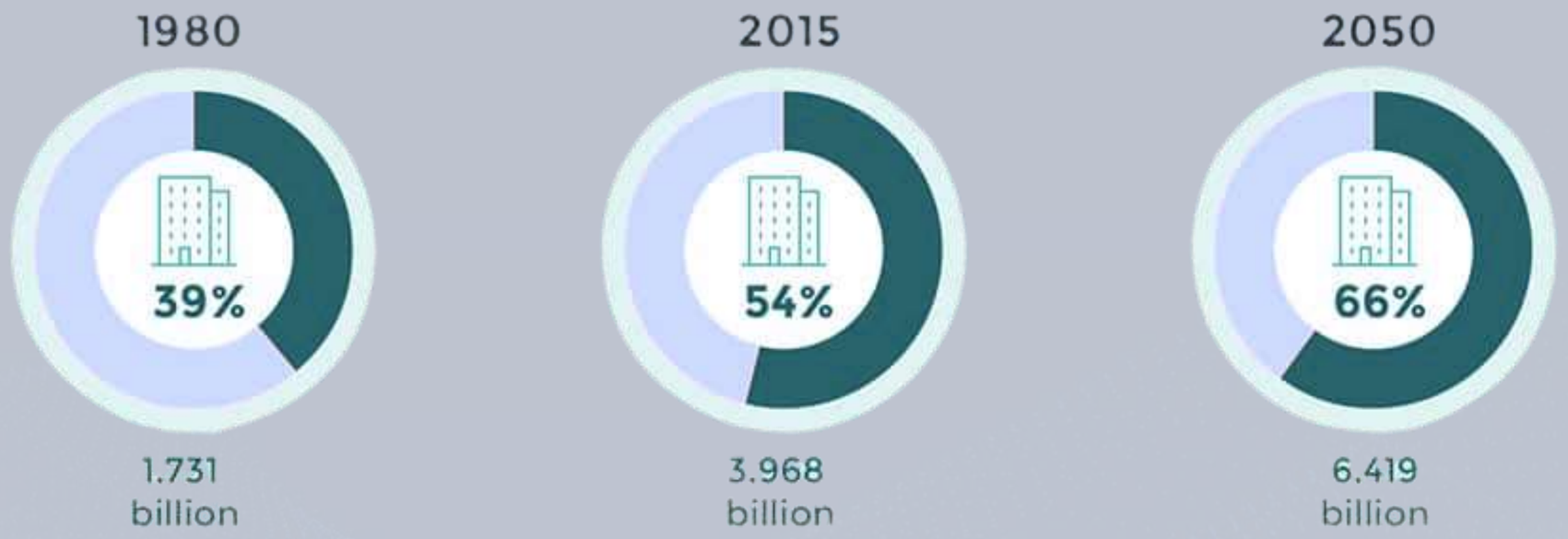
INVISIBLE COSTS

Urban failures

BRIDGEWATER PLACE, UK

INVISIBLE COSTS

Share of the Urban Population Worldwide



Source: United Nations, Department of Economic and Social Affairs, Population Division (2014)
World Urbanization Prospects: The 2014 Revision, custom data acquired via website

The urban digital twin

2 Debates

Debate Segment 1

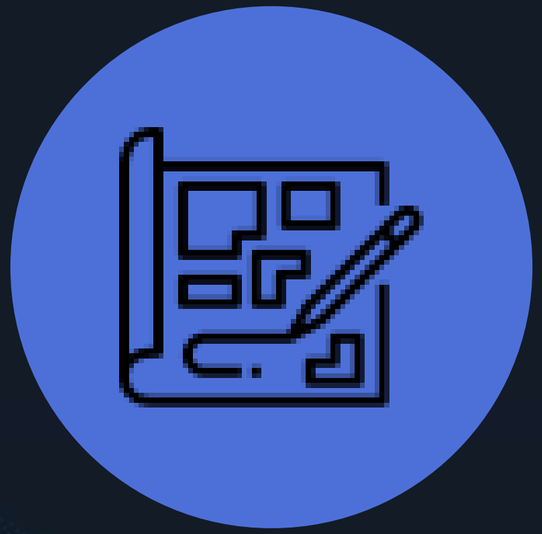
A

THE DIGITAL
Blueprint Vision

B

REALITY

A



Urban planning

Public funds

Financial losses

B

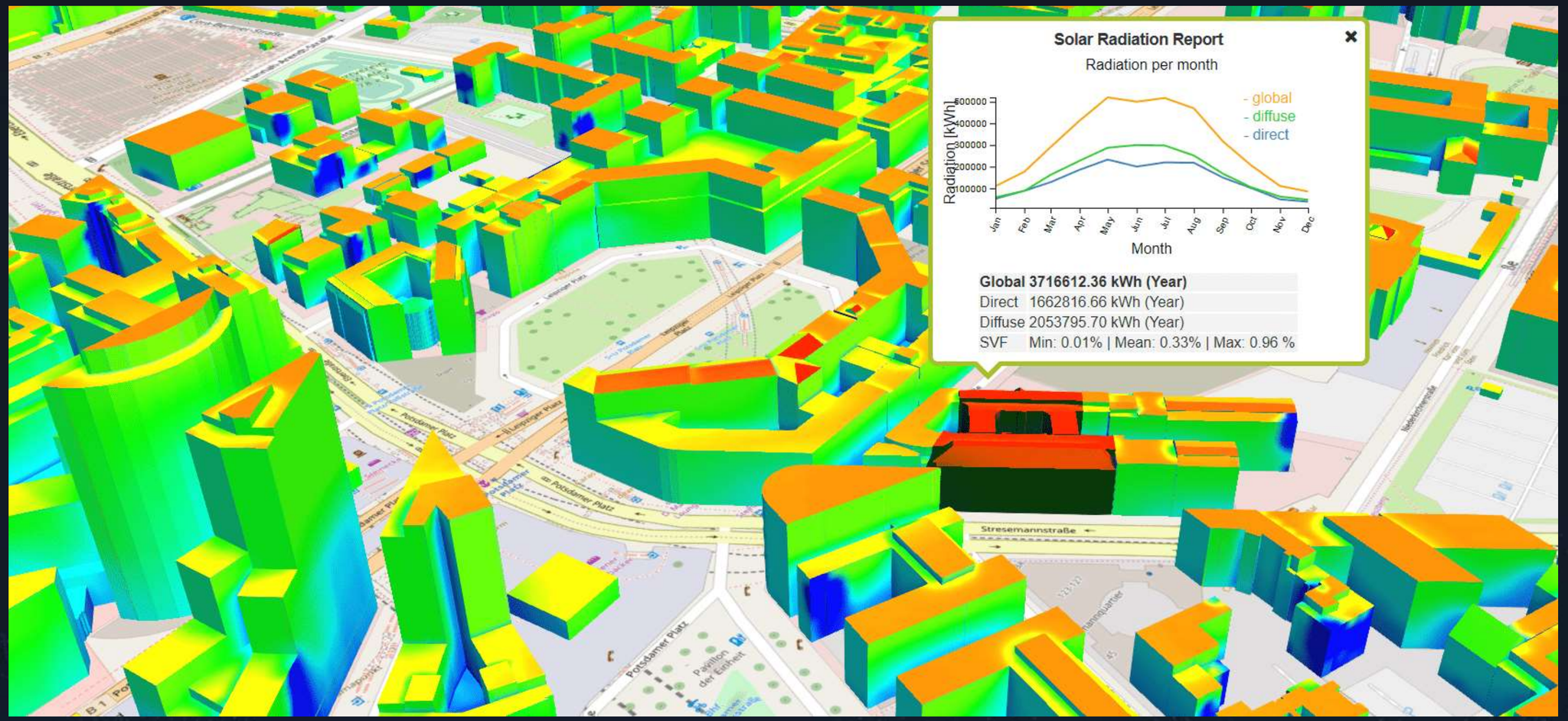
Flawed assumptions

Economic models

Human needs

“The wisdom of the carpenter matters more than the quality of the hammer.”

A



Sandbox ***Simulation*** ***Risk-free environment***

“Before a single shovel hits the ground.”

B

Design flaws

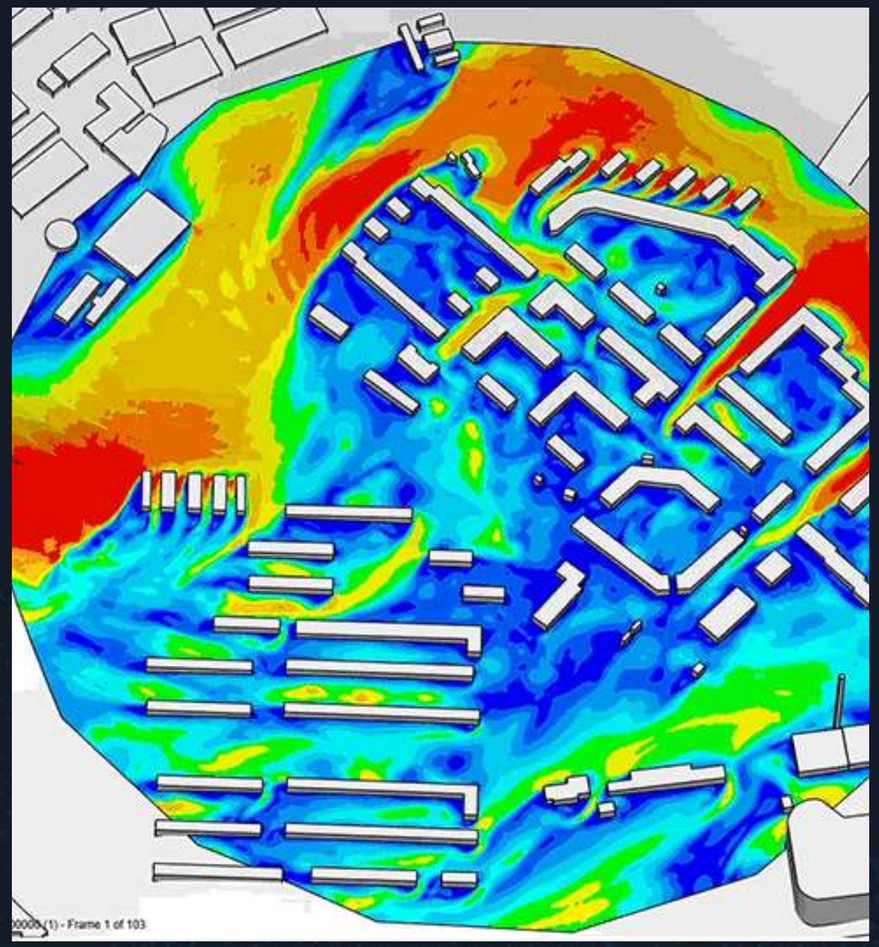
Affordable housing

Lifelike environments

“If everyone gets a castle, then no one has a castle.”

A

What-if testing



Data driven science

Pedestrian comfort

“Macro decisions meet micro realities.”

B

Economic viability

Community-building

Cultural blindness

“Beautiful failures are still failures.”

A

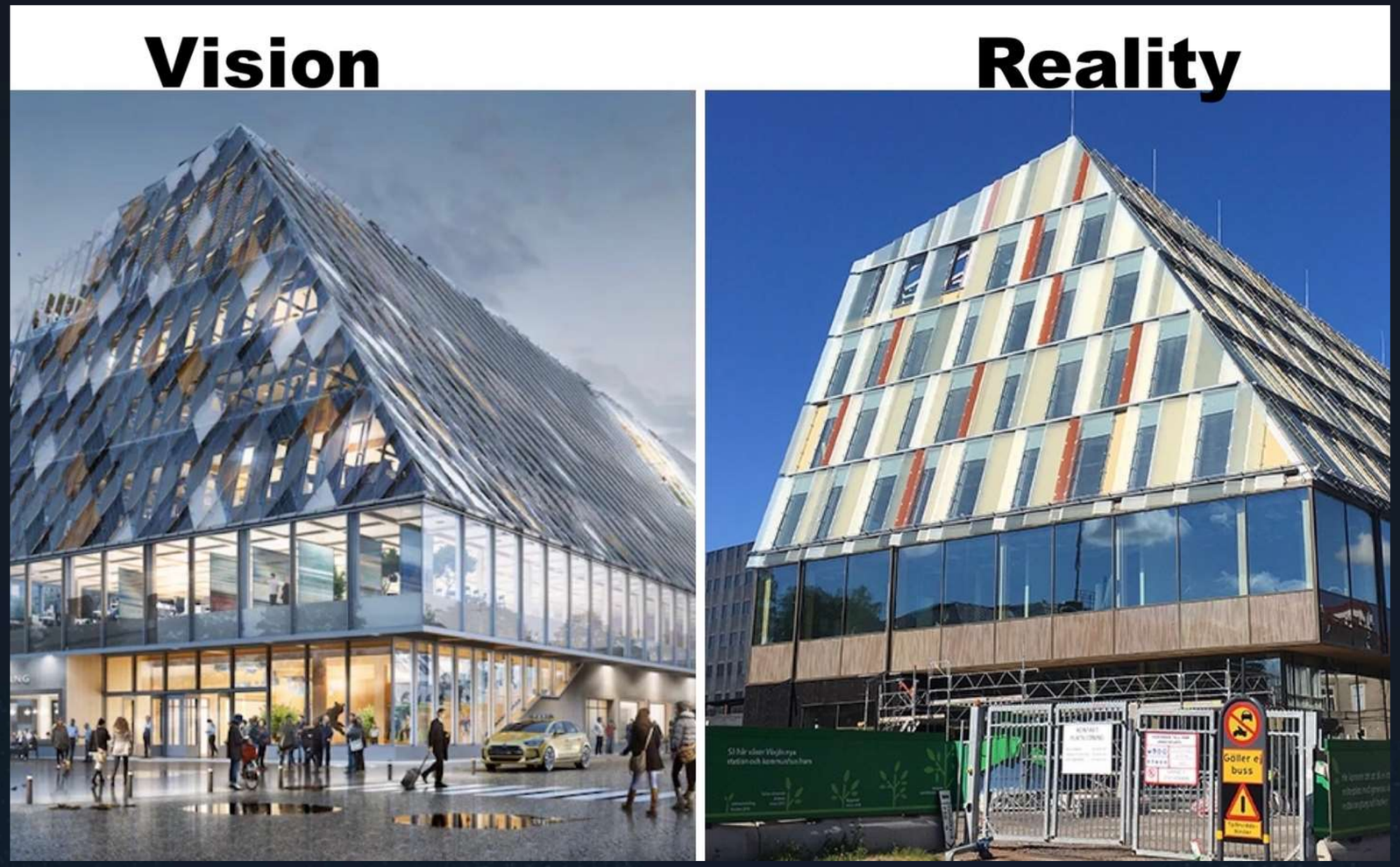
Proactively designing

Cost-effective

Human-centric cities

“We design from the very beginning—with people in mind.”

B



Human problem

Emotional fabric

On paper vs. reality

“It looks human-centric on paper. But what about in real life?”

Debate Segment 2

A

THE GHOST in the Machine - Intelligence

B

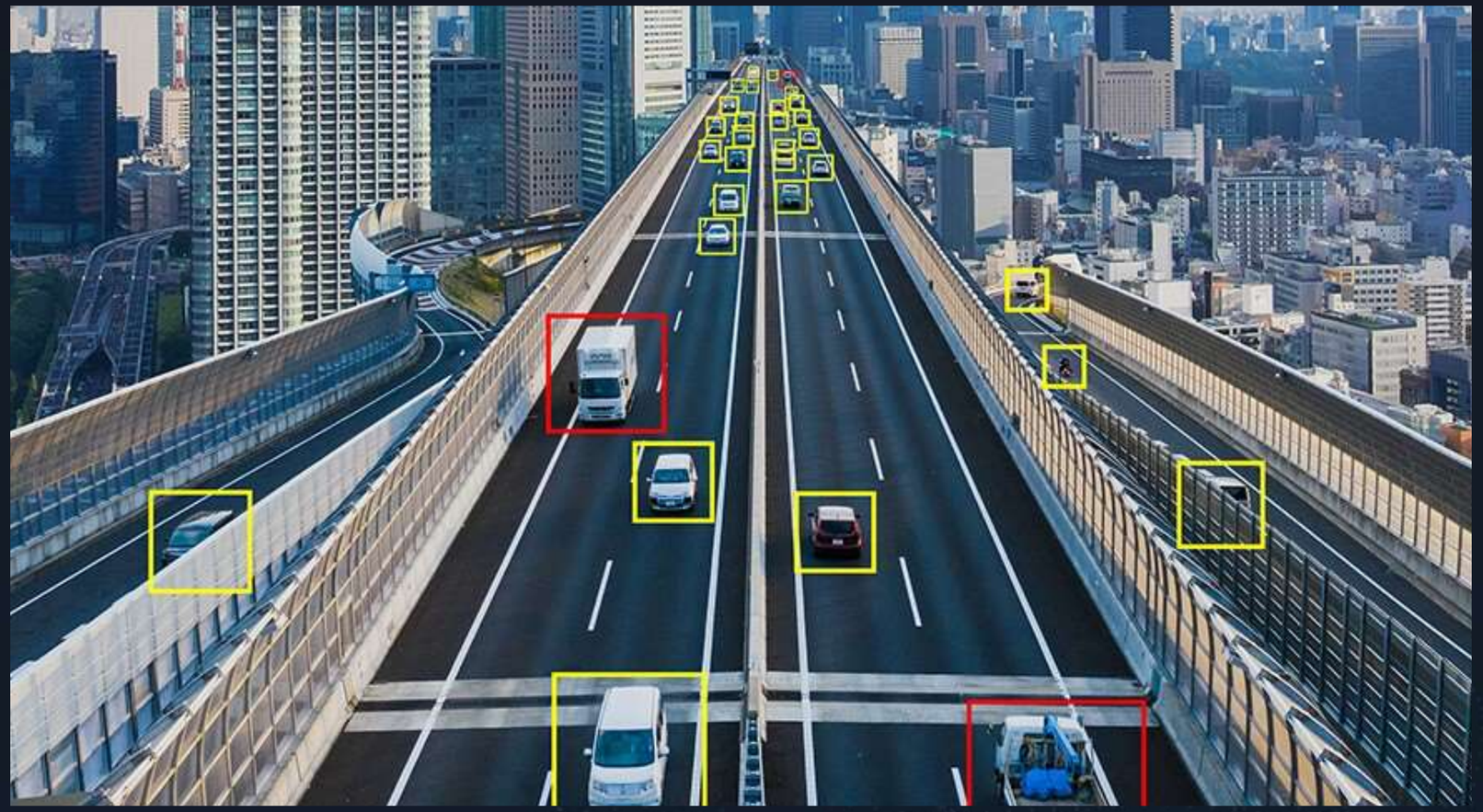
INTRUSION

A

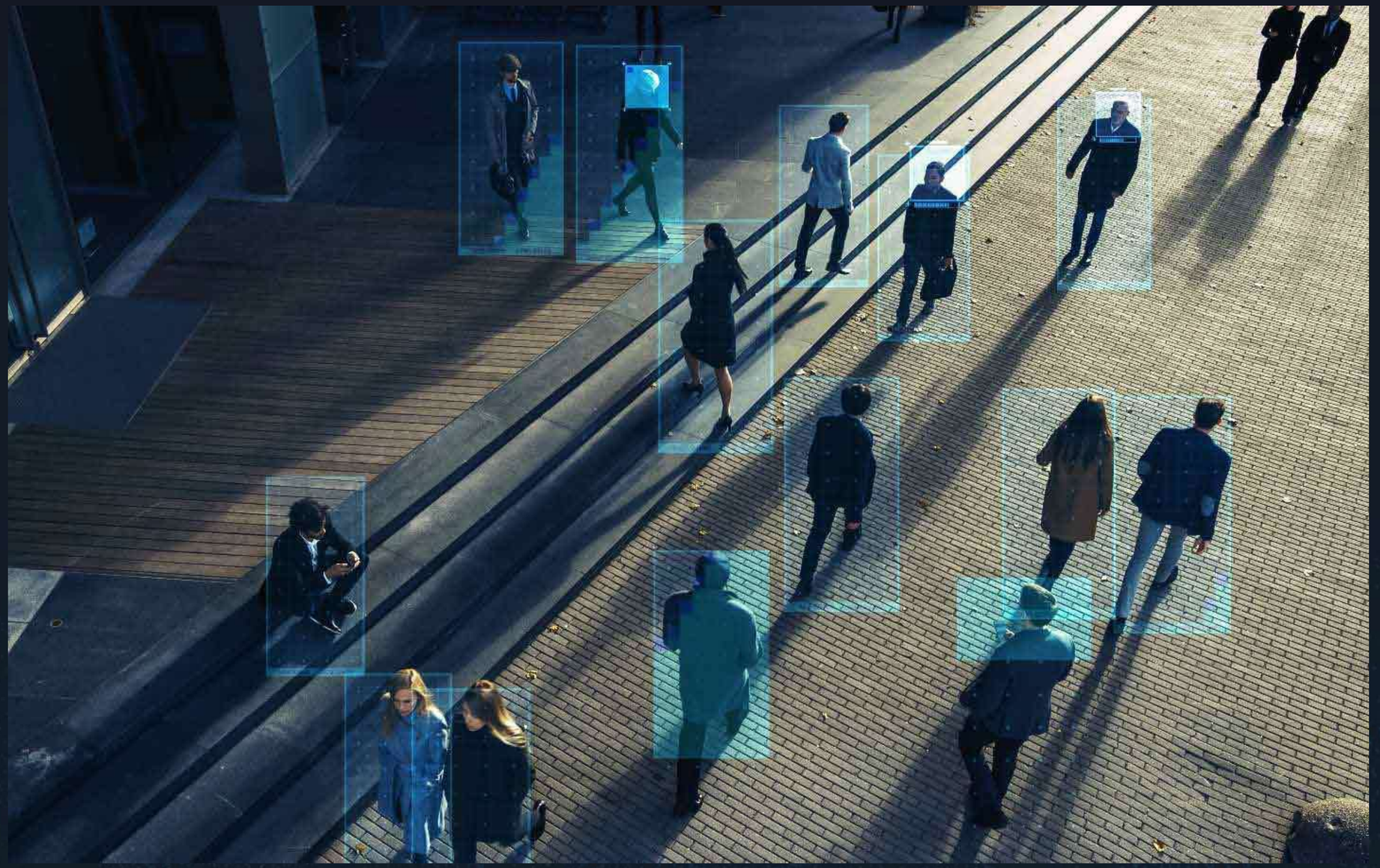
Living model

Dynamic brain

Real-time adaptation



“This isn’t a master plan. It’s a nervous system.”



B

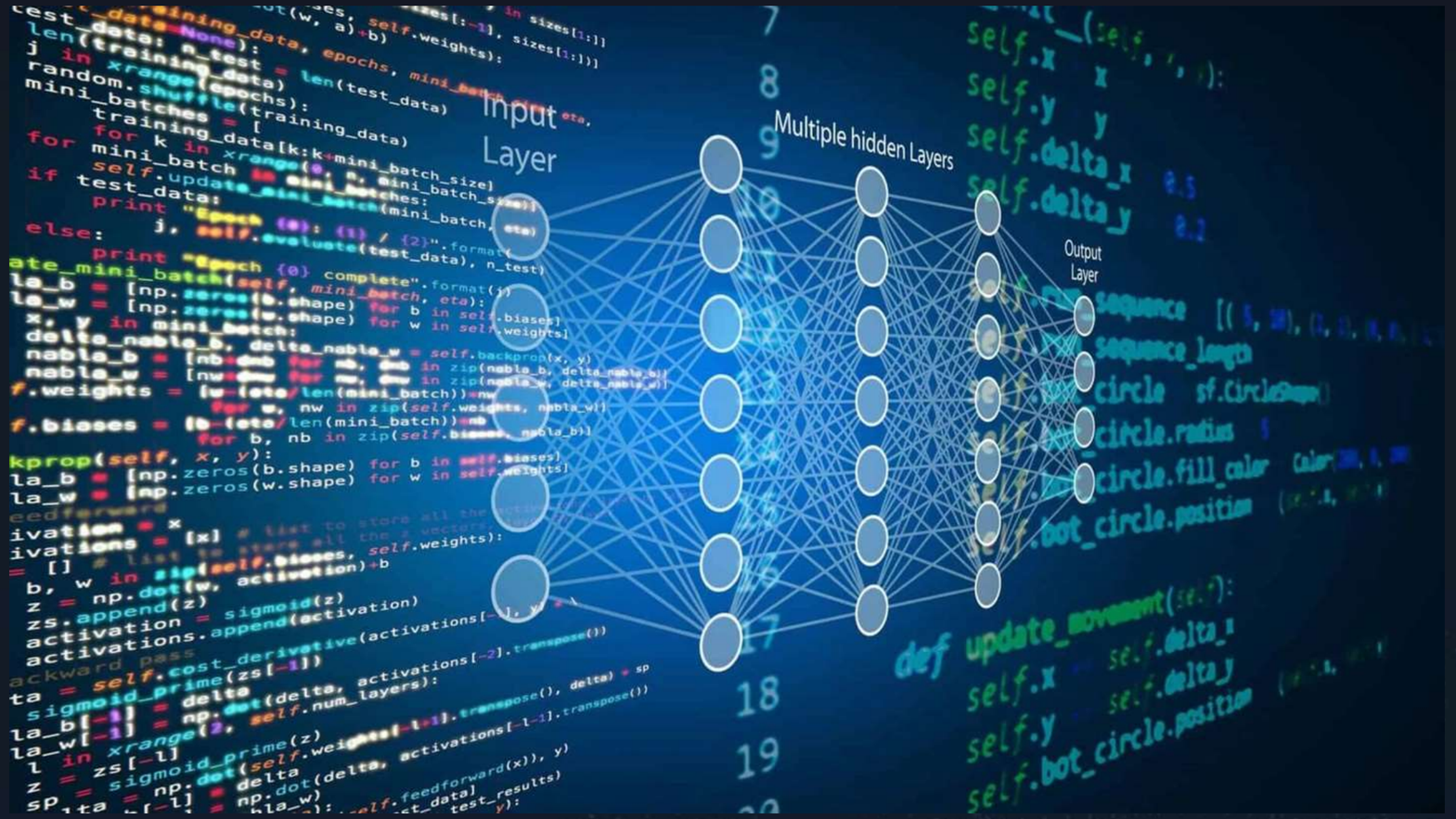
Urban surveillance

Tracking traffic

Monitoring pollution

Tracing movement

A



Data inputs

Sensors for air quality, energy used...
GPS tracking movement patterns
Cameras analyzing traffic flows

A

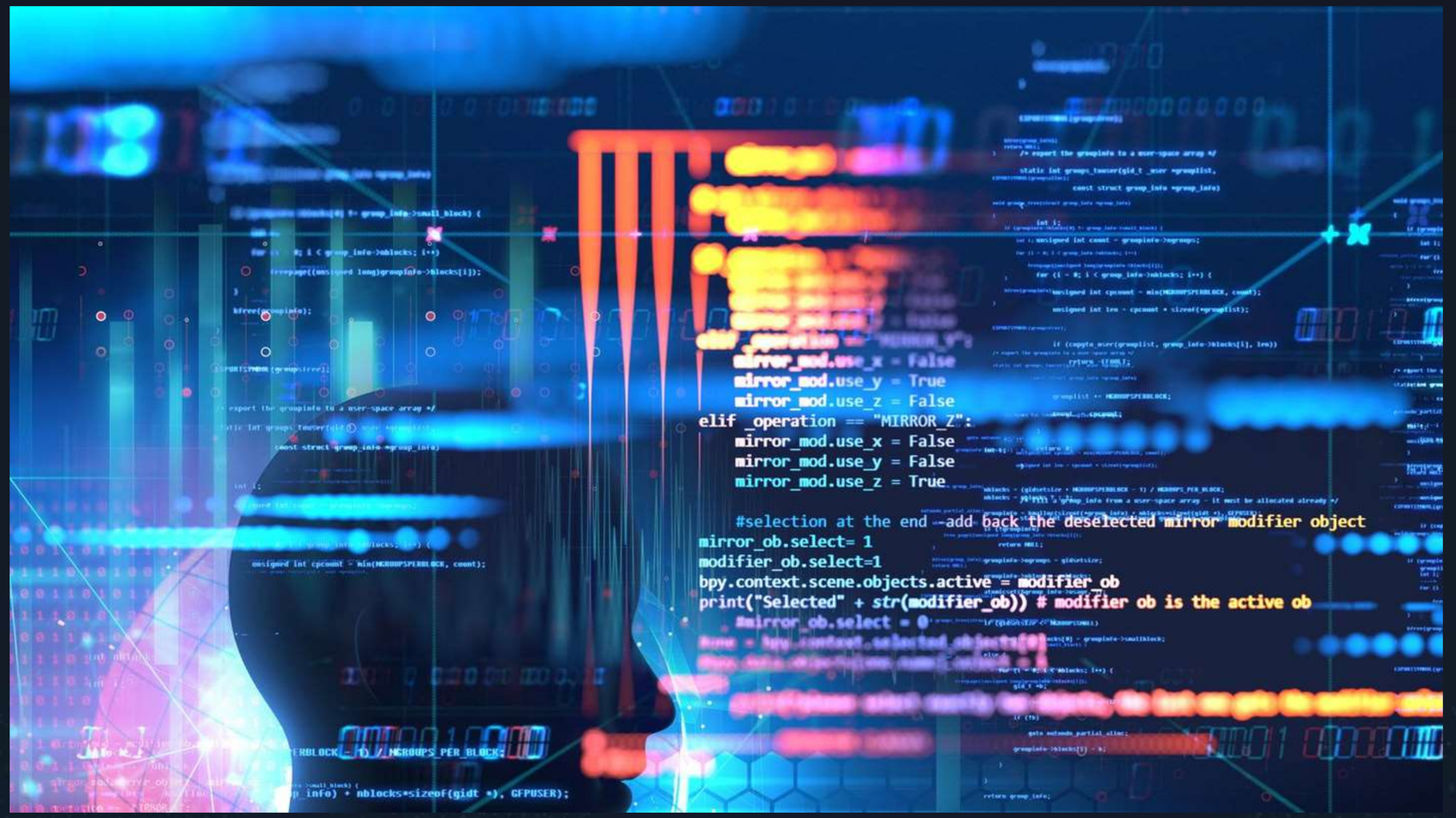
AI layer

Time-Series Forecasting
Anomaly Detection
Reinforcement Learning

A

Data analysis

Data Source Type	Specific Data Points Collected	Relevant AI/ML Task	Potential Actionable Intelligence
IoT Sensors	Air quality (PM2.5), noise levels, energy consumption	Anomaly Detection, Time-Series Forecasting	Reroute traffic away from pollution hotspots; predict and manage peak energy loads.
Traffic Cameras	Vehicle density, speed, queue length	Anomaly Detection, Computer Vision	Identify accidents or "phantom jams" in real-time; feed data to RL agents for traffic light optimization.
GPS Traces	Public/private vehicle movements, route efficiency	Time-Series Forecasting, Reinforcement Learning	Optimize public transport routes; predict congestion patterns based on city-wide movement.
Infrastructure Sensors	Vibration accelerometers, telemetry on buses/trains	Predictive Maintenance, Lifespan Prediction	Proactively schedule maintenance to prevent vehicle breakdowns and enhance passenger safety.
Weather Feeds	Precipitation, wind, temperature	Time-Series Forecasting, Scenario Simulation	Predict impact of snowstorms on traffic and proactively reroute; simulate flood risks.



B

Governance architecture

Urban Data Governance Models (UDGMs)
Algorithmic Transparency and Accountability
Ethical Frameworks

Debate Segment 3

A

B

OPTimization

OVERREACH

A

Feature/Characteristic	Traditional Traffic Management	AI-Optimized Digital Twin Approach
Control Mechanism	Fixed-time signals, Basic adaptive regulation	Dynamic ML-driven algorithms, Reinforcement Learning
Responsiveness to Conditions	Limited, reactive	Real-time, predictive, proactive
Scope of Optimization	Individual intersections	Network-wide optimization
Handling of Unexpected Events	Struggles with non-regular jams, human factors	Anticipates and adapts to events, mitigates human error
Reliance on Human Intervention	High reliance on human oversight	Minimal, autonomous
Impact on Congestion	High congestion, phantom jams	Significantly reduced congestion, smoother flow
Environmental Impact	Increased emissions from idling	Optimized flow reduces emissions

B

Unexpected events

Protests

Power outages

Cyberattacks

Debate Segment 4

A

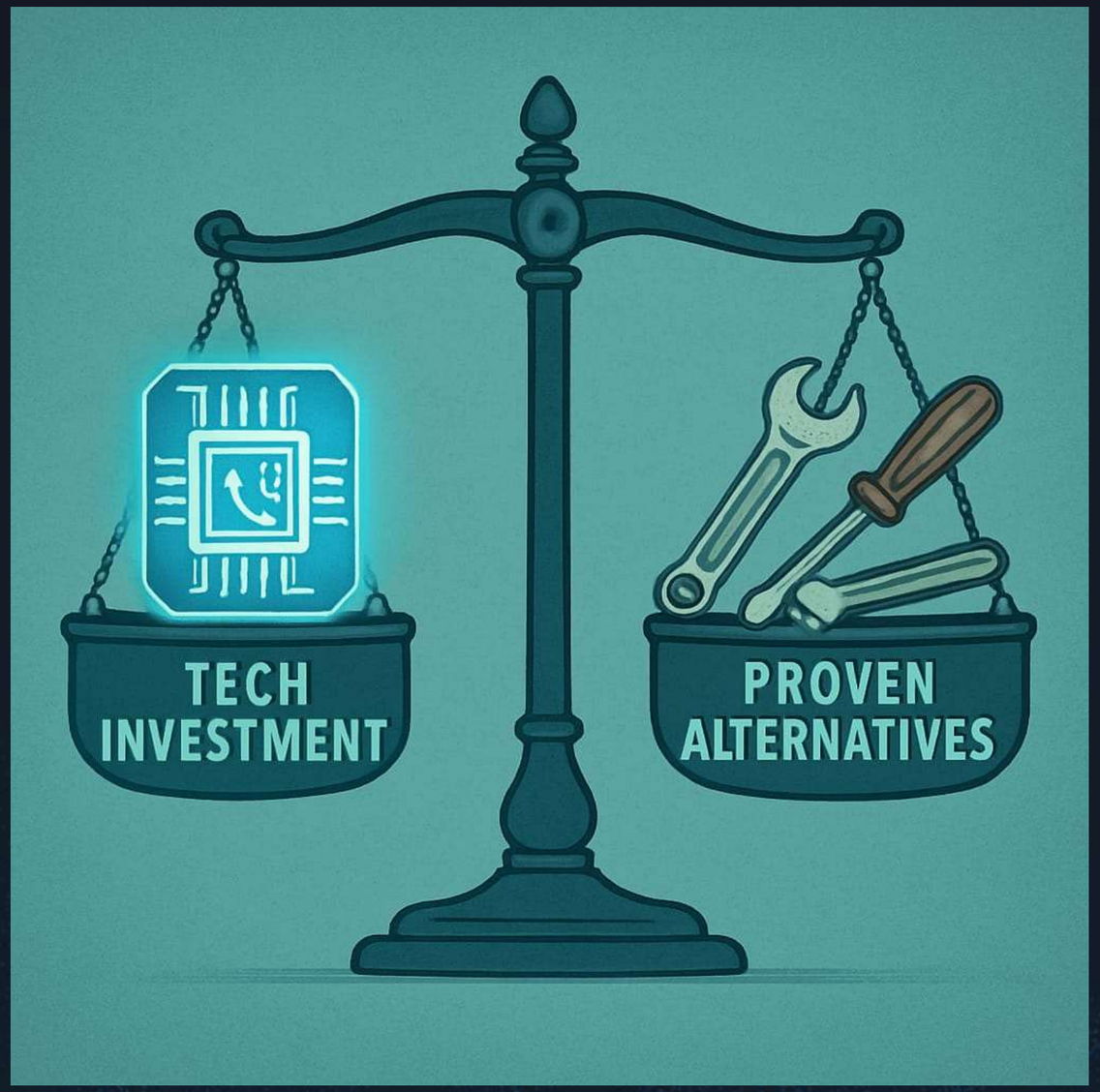
PROACTive Care

B

PROHIBITIVE COST

A

*“**Smart sensors** and **AI** predict failures before they happen—keeping public transport safe and reliable”*



B

*"High-tech solutions must prove they're **worth the cost** compared to simpler, proven options."*

3 Conclution

Beyond Fixed Blueprints: Cities as Living Systems

- **DIGITAL TWINS**: TOOLS FOR ADAPTATION, NOT PERFECTION
    - MANAGING CHAOS, ENABLING EVOLUTION

Smart Cities: Built on Trust, Not Just Tech

- COLLABORATIVE GOVERNANCE: **ALL VOICES IN**
- ETHICAL FOUNDATIONS: **PRIVACY FIRST**
- **THE GOAL**: SMART RESILIENT JUST CITIES

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THANK YOU FOR YOUR ATTENTION

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