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From Smart Cities to Net Positive Results

How AI Agents and Digital Twins Help Build Net Positive Cities

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Cities now stand at the frontline of the world's most complex and urgent challenges. Disproportionately impacted by extreme weather events, sea level rise and resource scarcity, environmental threats to cities are amplified by aging infrastructure and widening social inequality. To become part of the solution, they must evolve beyond "smart" to embrace a new model: the Net Positive City.

This white paper explores how Artificial Intelligence (AI), coupled with Digital Twins, can help urban leaders shift from incremental improvements to systemic transformation, adopting a Net Positive agenda to create an immediate, practical imperative for a healthier, more equitable and resilient urban future.

Introduction: From Smart to Net Positive

Cities are uniquely positioned to serve as platforms for innovation and impact. With over [70% of global CO₂ emissions originating from urban areas](#), they hold the key to meaningful climate action.

At the same time, there can be large differences in the environmental "footprints" showing the potential for radical decarbonization. [Among global megacities](#), for example, Tokyo emits four tons of CO₂ equivalent (tCO₂e) per capita, while London emits 10, and New York 17.

The smart city movement has already delivered significant gains in service optimization, congestion management, and resource monitoring. These gains however, are limited by their reactive nature. Efficiency is necessary, but not sufficient.

In these complex and interconnected environments, environmental factors cannot be considered in isolation from social ones. And it's when we consider the city as a system, lies the Net Positive opportunity.

Towards Net Positive Cities

Net Positive represents a shift in business strategy, going beyond the traditional focus of minimizing social and environmental footprints. It champions the creation of proactive impact strategies that not only benefit people and the planet but also enhance profitability and resilience.

By considering a reduction in 'footprint' in parallel with a positive 'handprint' of human-centric initiatives, quantitative emissions reduction and qualitative social action can create Net Positive results that deliver a healthier, fairer and more sustainable society. Never has this been more relevant in cities.

This is why Fujitsu's [Advancing Net Positive Agenda](#), which has been independently developed and researched by Economist Impact, helps organizations' leadership to strategically align reductions in environmental footprints with the cultivation of positive handprints through forward-thinking, human-centric action.

A Net Positive agenda can be the most transformative in urban environments. Net Positive Cities go further: restoring ecosystems, improving air and water quality, fostering economic equity, and enhancing human wellbeing. These cities deliver more than they consume.

This is especially apparent in large-scale infrastructure projects, which can result in unmatched efficiency if embraced by the public, while poor planning risks significant resource wastage. Consequently, urban areas with high levels of positive infrastructure concentration can have a low environmental footprint per capita. In contrast, sprawling urban developments without coordinated ecosystems can destroy natural habitats and contribute to substantial pollution.

This is not a utopian vision. It is a competitive imperative. Cities that lead in Net Positive transformation will attract investment, talent, and innovation. Those that lag will face escalating costs, declining resilience, and eroding trust.

The Advancing Net Positive Agenda

Decrease the environmental Footprint

Increase the positive Handprint on people and the planet

Net Positive

See: [Executive summary | The Net Positive Index](#)

The Shift to AI-Driven Urban Systems

Smart city technologies such as digital platforms, IoT, and service automation have laid a critical foundation. But without coordination, integration, and human-centric design, many cities risk falling into the trap of passive automation: using digital tools to do old things more efficiently, instead of reimagining what is possible.

Artificial Intelligence (AI), when combined with digital twins, especially Fujitsu's [Social Digital Twins™](#), enables cities to simulate, predict, and shape urban life in real time. Social Digital Twins extend traditional digital twin models by incorporating behavioral, economic, and social data, creating a dynamic model of city systems and citizen interactions.

Fujitsu has pioneered the use of digital twin and AI technologies in several international cities. In Kawasaki, Japan, Fujitsu developed a digital twin to simulate traffic and pedestrian flows for optimized urban design. In Montreal, it is deploying a [Fujitsu smart city AI solution](#) to analyze traffic flows, plan service maintenance and reduce air pollution. And in Norwich (UK) Fujitsu [improved micromobility](#) turnover by optimizing scooter bay locations.

From Digital Twins to Net Positive Systems

City planning and large-scale infrastructure projects have always offered fertile ground for innovation. Now, with the emergence of real-time, AI powered digital twins and Fujitsu's Social Digital Twins™, urban administrators and planners can transition from reactive decision making to intelligent, proactive orchestration at scale.

Digital twins are not new, but they are rapidly evolving. Once simple static models used by system integrators, they have matured into dynamic, data rich simulations that mirror the behavior and condition of physical assets and systems in real time. Built on a foundation of diverse data sources such as traffic lights, utility pipes, public buildings, IoT devices, and historical records, these virtual replicas become the reflection of the true state of a city's infrastructure.

Crucially, digital twins are not merely about visualization. They become predictive engines that can model future scenarios, test proposed changes, and assess cascading impacts. This capacity for foresight is amplified by the integration of AI agents' software systems that learn from data, make decisions, and act autonomously within defined parameters.

Already today, the results are impressive. In Norwich UK, micromobility company Beryl de-risked their change strategy by using Fujitsu's Social Digital Twin™ technology to select the optimal new rental bay locations, doubling revenue and ridership in just 2 months.

As a core-part of Net Positive strategies, AI-driven Social Digital Twins™ take the human aspects into digital twins. They enable city managers to carry out digital rehearsals that fuse behavioral science with AI modeling, try out changes in safe virtual simulations with real world data, and develop AI Agents that interact with their ecosystems for optimum results.

Social Digital Twin

Beyond real-time analytics, run different scenarios to find optimum solutions through Digital Rehearsal Technology.
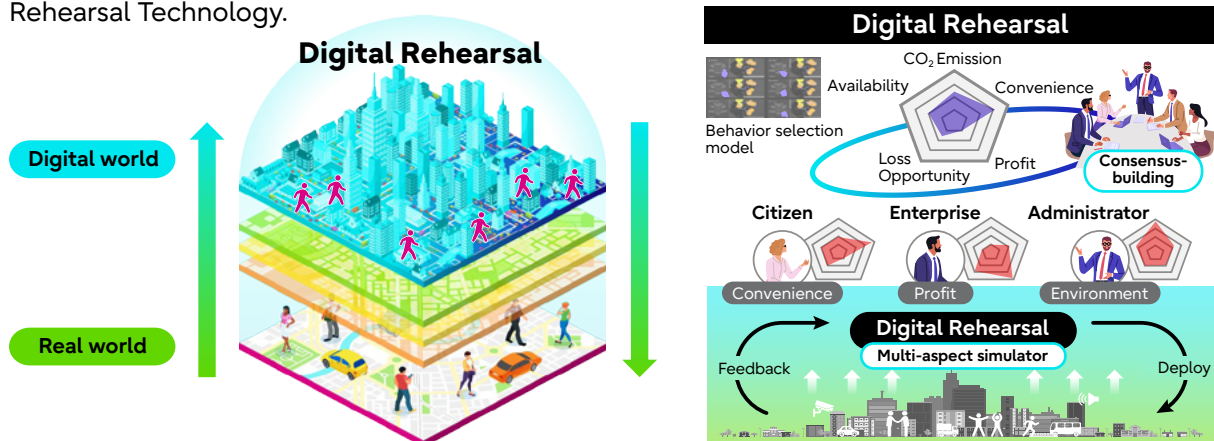
See: "Social Digital Twin" Technology

Dr Makiko Hisatomi, Executive Director, Fujitsu Research of Europe, says: "*It is a prime example of how our technology can contribute to society via a demand-based data-driven approach, building a viable strategy to achieve Net Positive.*"

Together, digital twins and AI agents create a new operational paradigm: cities that can sense, think, and act.

Harnessing Net Positive Change: Digital Twins in Action

One of the most underutilized capabilities of digital twins is the ability to use them for public engagement and to nudge citizens toward more desirable and sustainable behaviors without mandates or enforcement.

By analyzing real-time data from mobility patterns, energy usage, and environmental conditions, digital twins can simulate citizen responses to different interventions and create timely, personalized prompts:

- A digital assistant may suggest switching to public transit during peak pollution hours.
- Dynamic pricing or incentives can encourage off-peak travel or carpooling.
- Citizens can see the real-time CO_2 savings from sustainable actions, reinforcing habits over time.

Fujitsu has explored this in mobility projects that combine behavioral AI with city-wide digital twins. In one project, citizens using a transport app received personalized mobility suggestions based on air quality and congestion, leading to a measurable modal shift to walking and cycling.

Such nudging strategies (soft interventions), grounded in behavioral economics, move urban governance from reactive to proactive, from monitoring behavior to mobilizing it. The goal is not control, but empowerment: embedding Net Positive behavior into the rhythm of everyday city life.

The Role of AI Agents: From Models to Autonomous Action

AI Agents are pivotal in harnessing the transformative potential of digital twins, surpassing the capabilities of traditional data dashboards. These intelligent agents continuously analyse streaming data, detect anomalies, simulate outcomes, and autonomously recommend or execute actions. They can be built on basis of existing smart city technologies and gain from the development of Sustainable AI solutions. In urban environments, they serve as digital stewards, tirelessly optimizing systems and orchestrating responses across diverse domains.

Unlike conventional AI, which needs ongoing human oversight, Agentic AI possesses the ability to dynamically adapt and optimize city operations. This includes traffic management, energy distribution, waste management, and public safety.

Consider the transformative potential of AI in city mobility. AI agents overseeing a digital twin of the transport system can swiftly identify unexpected congestion, correlate it with real-time weather forecasts or local events, and autonomously implement solutions such as rerouting traffic, prioritizing public transport, or adjusting traffic light timings to restore seamless flow. These decisions are executed in mere seconds, vastly outpacing traditional manual processes.

The true value lies in coordination. Urban systems – encompassing mobility, energy, water, waste, and safety – seldom operate in isolation. As AI Agents increasingly empower these systems, the orchestration of agents across interdependent networks will enable them to function harmoniously. This synergy unlocks efficiencies and mitigates the domino effects that often precipitate city-wide disruptions.

Building the Right Ecosystem: Partnerships as Accelerators

Technology alone won't transform cities. Cities need ecosystems: partnerships with technology companies, academia, civil society, and startups to experiment, validate, and scale innovation.

Globally, city leaders are prioritizing the development of AI innovation ecosystems:

- [76% are building partnerships with startups and tech firms](#)
- [66% are collaborating with universities and research bodies](#)

Fujitsu's global city collaborations reflect this shift.

- In **Montréal**, Fujitsu deployed a [smart city AI solution to analyze the traffic flow](#) of around 2,500 traffic lights to make informed decisions, helping the city take quick and decisive action to proactively reduce traffic-related issues before they occur. The result is smoother traffic flows, less congestion, and reduced air pollution.
- In **New Delhi** and **Mumbai**, [the optimal placement of EV charging stations](#) reduced charging time per delivery, including travel and waiting times, by 70%, led to a 13% reduction in fuel costs, and more than 60% lower CO_2 emissions.
- In **Japan**, Fujitsu and Yamato, Japan's major shipping and logistics company, developed an AI-powered inter-city [sustainable transportation platform](#) for 1.7 million corporate customers and more than 3,500 logistics partners. It is expected to reduce GHG emissions by 42% and transport labor costs by 65%.

Fujitsu is closely [working in collaboration with municipal governments](#) and research institutions to explore real-time applications across sectors in energy efficiency, circular economy, and disaster response.
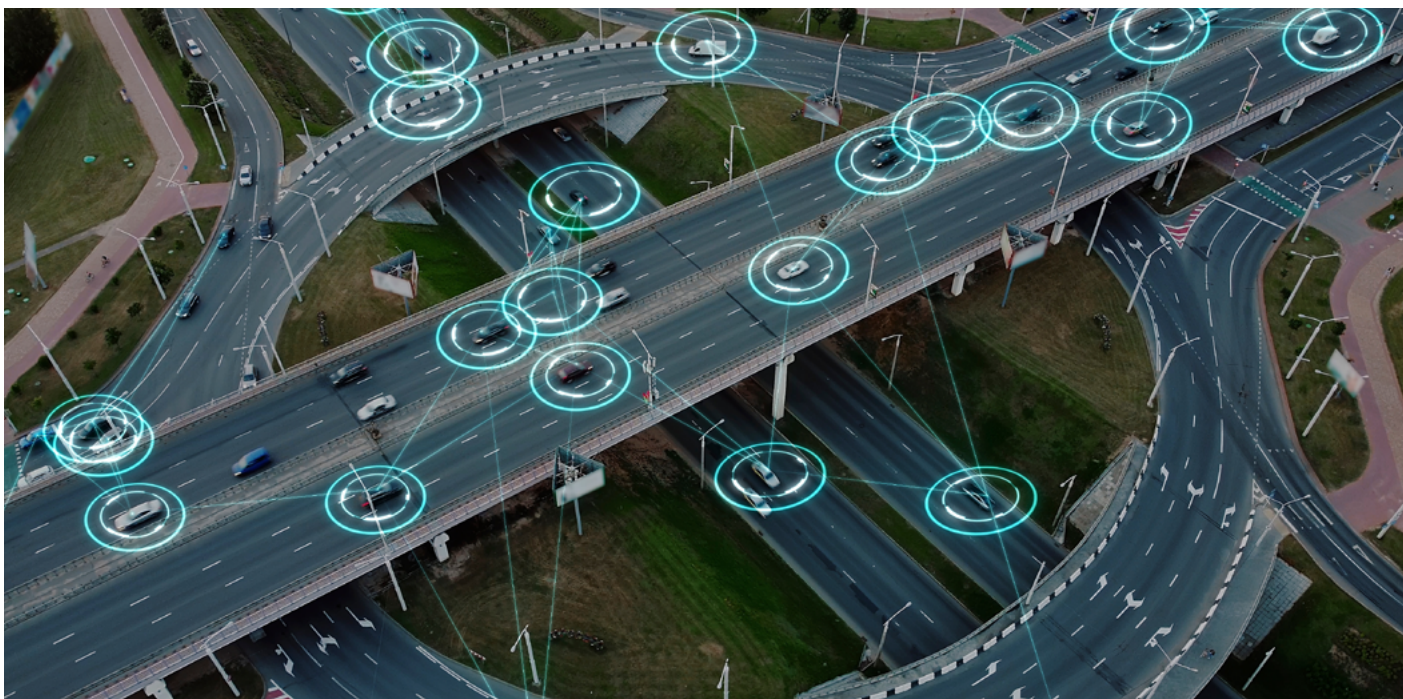
Cities Experimenting with AI Clouds and Infrastructures

The rapid decline in the cost of cloud AI infrastructures, driven by private sector innovation, makes AI experimentation increasingly accessible. While training complex AI models remains costly, these costs are shared by global platforms and their billions of users. City managers can build on this experience, experimenting with AI by establishing clear guardrails and fostering interoperable ecosystems, open to public and private partners, including startups.

This widespread development of AI infrastructure on cloud platforms by global IT companies is paving the way for city infrastructure, as these technologies become "democratized" through evolving global standards and open platforms.

However, when building the city of the future, city managers must go beyond simply following private organizations; they must actively enable and orchestrate AI ecosystems built on open standards and platforms, accommodating diverse public and private partners.

Managing Open Standards and Data Spaces for City Ecosystems

City managers face unique challenges in data management, distinct from private organizations. Beyond safe and efficient data handling, they must safeguard their sovereignty in data management and guarantee unrestricted partner access, avoiding vendor lock-in.

To facilitate such cooperation and integration, Fujitsu is supporting the development and implementation of global standards for environmental data. These include the PACT Methodology for product carbon footprint (PCF) data exchange, established by the World Business Council for Sustainable Development (WBCSD), and the Open Group's Open Footprint© data standard for environmental footprints.

Fujitsu also champions public-private initiatives for federated international data spaces (IDS) like Europe's Gaia-X. These federated clouds enable secure sharing of sovereign ecosystem data, with each partner retaining control by storing data on their own servers or within private or public clouds. Secure connectors, identity management, and encrypted communication facilitate data access. It is now developing a framework for Multi-Agent ecosystems that allow AI Agents to securely work across diverse data spaces.

Dr. Tomoko Nagano of Fujitsu's Strategic Planning Unit, who has worked with global suppliers to decarbonize supply chains, points to the importance of such collaboration: "*Collaboration through integrated systems is essential, even in the face of challenges. Embrace the journey early; meaningful change takes commitment and cooperation.*"
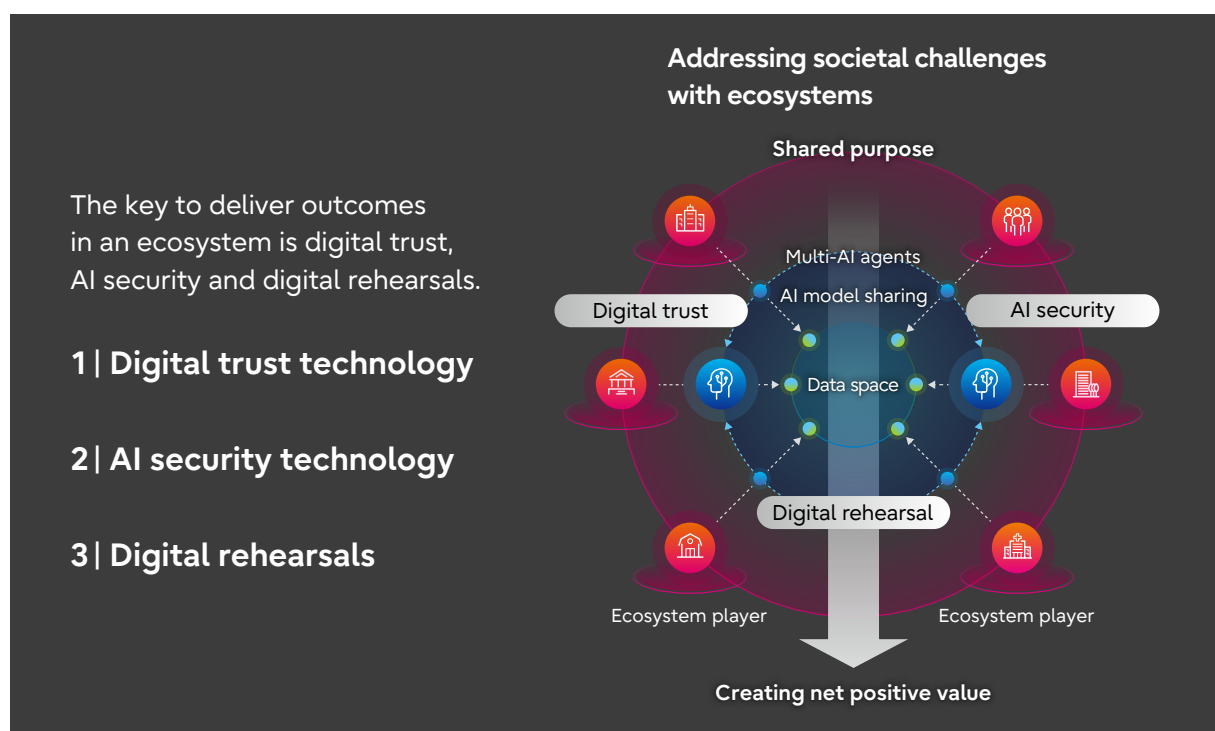
This approach empowers city managers to construct robust data ecosystems, laying the groundwork for digital twin applications and Agentic AI platforms. By collaborating with partners while maintaining data control, cities can harness the full potential of digital innovation, driving sustainable urban development and enhancing community well-being.

Governing the Convergence of Physical and Digital Worlds

Digital twins and AI agents are not ends in themselves. They are enablers of a broader transformation: the shift from Smart cities that focus reactively on automation and optimization to Net Positive cities, focused on resilience, inclusion, and long-term sustainability.

A smart city reroutes traffic during a parade. A Net Positive city anticipates the social, economic, and environmental ripple effects of that event and adapts holistically. A smart city predicts where power will be needed. A Net Positive city allocates energy equitably and in alignment with climate goals.

Technologies enabling ecosystems

The key to deliver outcomes in an ecosystem is digital trust, AI security and digital rehearsals.

1 | Digital trust technology

2 | AI security technology

3 | Digital rehearsals

Addressing societal challenges with ecosystems

Shared purpose

Multi-AI agents

AI model sharing

Digital trust

AI security

Data space

Digital rehearsal

Ecosystem player

Ecosystem player

Creating net positive value

Source: [Fujitsu Technology and Service Vision](#)

As cities deploy more sensors, connected infrastructure, and data-sharing platforms, the boundary between physical and digital environments is blurring. AI and digital twins rely on sensitive data from personal mobility to energy consumption and trust is paramount.

Robust data governance and cybersecurity frameworks are essential. In Denmark, for example, [a coordinated cyberattack](#) on 22 power companies in 2023 highlighted the vulnerabilities of operational technology systems.

C-level executives must embed governance by design into every stage of deployment:

- **Privacy Controls:**
  Adopt transparent, citizen-centric data policies with granular consent mechanisms.
- **Cybersecurity Protocols:**
  Secure critical infrastructure with multilayered defenses and active monitoring.
- **Ethical Oversight:**
  Establish independent bodies to audit algorithmic fairness and data use.
- **Open Standards:**
  Promote interoperability and avoid vendor lock-in through open architectures.
- **Skills and Systems Thinking:**
  Cultivate teams that blend engineering, data science, planning, and public administration to cultivate a new mindset.

Trust is not a side issue; it's a strategic asset. Cities that prioritize ethical technology governance will secure citizen loyalty and global credibility.

The Executive Imperative: From Digital Projects to Regenerative Strategy

The Net Positive transition in city ecosystems is primarily a leadership challenge, not a technological one. For C-level executives, this means:

- Embedding digital and behavioral intelligence into core city strategy
- Reallocating capital toward scalable, high-impact technologies
- Championing governance frameworks that prioritize trust and inclusion
- Cultivating partnerships that unlock system-level innovation.

In this new model, cities become not just service providers, but regenerative platforms: ecosystems that enhance wellbeing, restore nature, and generate inclusive prosperity.

Mayors Lead the Charge:
Cities at the forefront of Climate Action

In an era of geopolitical shifts, mayors are redefining leadership, uniting to drive urgent climate action in the lead-up to COP30 in Belém.

Initially, cities' complex ecosystems and engagement structures seemed to hinder their progress, even as national governments and private organizations advanced with regulatory action and renewable energy initiatives. However exciting data from C40, the global network of 100 mayors of the world's leading cities, reveals a significant shift: three-quarters of C40 cities are now reducing emissions faster than their national governments. Impressively 73% of these cities have already peaked their emissions while simultaneously creating over 16 million green jobs.

Their efforts prioritize equitable transitions, ensuring climate benefits are shared, and vulnerable communities protected. To achieve these goals, smart cities are leveraging data-driven insights, fostering cross-sector partnerships, and engaging citizens in co-creating sustainable urban futures, championing a dynamic, adaptive form of urban governance that empowers local actors and accelerates the adoption of innovative climate solutions.

The increasing visibility of city executives is evident at global platforms like London Climate Action Week where three main themes emerged:

- **Technological Innovation:**
  The "Climate-Tech Innovation Showcase" featured over 100 startups, venture capital firms and potential investors. The World Business Council for Sustainable Development (WBCSD) convened a High-Level roundtable where Fujitsu and other leading technology companies explored AI's potential for decarbonization.
- **Multi-Stakeholder Collaboration:**
  Complex problems demand multi-faceted solutions. The WBCSD called for action across value chains, recognizing its member companies including Fujitsu account for 26% of global emissions.
- **Climate Resilience:**
  Discussions emphasized the need to invest in climate-resilient infrastructure, such as flood defenses, green roofs, and urban cooling systems. The integration of nature-based solutions into these discussions was particularly notable.

Luke Antoniou, Senior editor SmartCitiesWorld, aptly summarized the role of cities at the close of LCAW:

"While climate change is a global challenge, the solutions are being shaped, tested, and scaled in our cities. Across every aspect from digital innovation to citizen engagement, we've seen that climate action at the local level is where the big things are happening."

Action Plan for C-Level City Leaders

To harness the full potential of AI and digital twins, city executives should take the following steps:

1. **Reframe the Vision:**
   Move from efficiency-focused 'smart' strategies to regenerative Net Positive goals. Embed social, environmental, and economic KPIs into every digital initiative.

2. **Pilot with Purpose:**
   Use ROI-focused pilots to demonstrate value. Target quick wins in transport, energy, and waste systems, then reinvest savings.

3. **Build Data Governance Early:**
   Establish strong ethical frameworks around data use, AI, and citizen privacy. Invest in cybersecurity and open, secure data spaces from the start.

4. **Engage Citizens:**
   Involve residents in the design of nudging systems. Co-create behavioral incentives to enhance Net Positive engagement and impact.

5. **Partner Strategically:**
   Tap into academic, private sector, and civil society partnerships. Use them to accelerate experimentation and scale what works.

At Fujitsu, we stand ready to help city executives and their partners to lead this transformation. Our strength lies in our collaborative ecosystem. We integrate deep technological expertise with a robust collaborative framework. This provides a great match for the multifaceted challenges facing modern cities that demand a holistic, multi-stakeholder approach, where no one entity possesses all the answers. We facilitate the co-creation of bespoke solutions by working in close partnership with city executives and local stakeholders.

Conclusion:
From Smart City to Net Positive City

The next generation of urban leadership will be defined not by who builds the tallest buildings, but by who builds the most responsive, inclusive, and anticipatory systems. Digital twins, which empower AI Agents, and the underlying data ecosystems offer a blueprint for that future.

AI and digital twins, especially Fujitsu's [Social Digital Twins™](), provide a new playbook not just for managing cities, but for mobilizing them. With the right vision, governance, and partnerships, the Net-Positive City is not just possible it is already emerging. As we have shown, Net Positive cities will be able to move from fragmented systems to integrated ecosystems, from reactive governance to predictive management, from generic services to personalized experiences. The result: safer, more resilient, and more livable cities for everyone.

About the authors

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September, 2025 v1.0