

Rotterdam Citiverse Vision 2030

The Physical, Social, and Digital Realms
Converge to Enhance the Quality of Life for all

July 2025



THE
METAVERSE
INSTITUTE



About The Metaverse Institute

The Metaverse Institute is made up of pioneers in AI, Digital Twins, Smart Cities, and other frontier technologies. We specialise in identifying the most effective use cases across a multitude of industries. Our renowned leaders employ evidence-based, rigorous, and pragmatic methodologies to help organizations—including the UN, governments, investors, and large corporations. We empower them to fully capitalise on the latest advancements in frontier technologies, driving significant gains in both profitability and purpose.

About The Author



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Christina is a metaverse pioneer, who started the journey in 2006 with a PhD using digital twin for the Architecture, Engineering and Construction industry.

Christina has 19 years' experience turning forward-thinking ideas into successful businesses. She worked for QS, the world university rankings agency 2013-2020, as China Director. Starting from scratch, she grew the UK-headquartered firm's success in China. Her work impacted China's 5 years funding allocations to 3005 universities with 48 million students, and a budget of £750bn. Between 2012 and 2013, she worked in the UK Parliament developing policy for the Shadow Business, Innovations and Skills Secretary's team.

She has sat on 20+ committees for UNESCO, World Bank, EU, UK governments on Innovation. She served as the founding co-chairman on Pre-standardisation for the Citiverse TaskGroup, exploring the use of AI and virtual worlds at the International Telecommunication Union, a specialized agency of the United Nations(UN). She is the author of "People-Centred Citiverse" – the UN's first approved technical report on the subject – which introduced an 8-level entry point for a people-centred and planet-friendly digital future. Her co-authorship extends to UN reports such as "Definition of Metaverse," "Metaverse for All Part I Legal Framework," and "Part II Survey," alongside contributions to the "Future of Travel in the Metaverse" in collaboration with UN Tourism and the "Definition of Citiverse."

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Foreword

Rotterdam has always been a city of pioneers—bold, resilient, and unafraid to reinvent itself. As we navigate the complexities of the 21st century, the Rotterdam Citiverse emerges as our next great endeavour: a visionary integration of the physical, social, and digital dimensions of urban life. This is not just a technological leap but a fundamental reimagining of how city functions, collaborates, and thrives.

A Vision Rooted in Rotterdam's DNA

The Citiverse builds on Rotterdam's legacy of innovation, hard work, and social equity. Our city's strength lies in its people—pragmatic, inventive, and determined—qualities that will drive this transformation. The Citiverse is not a standalone project; it is an evolution of Rotterdam's "Next Economy", where digital advancement serves human needs first.

At its core, the Citiverse is about empowering citizens—giving them the tools to shape their environment, access services seamlessly, and participate in decision-making like never before. It is about businesses and entrepreneurs finding new opportunities in a connected urban ecosystem. And it is about government becoming more responsive, efficient, and transparent through data-driven governance.

Why the Citiverse Matters Now

Cities worldwide face unprecedented challenges—climate change, inequality, digital disruption—but also unprecedented opportunities. Rotterdam's Citiverse positions our city as a global leader in urban innovation, demonstrating how technology can be harnessed for inclusive, sustainable progress.

Key to this vision is our commitment to:

- Public control over technology – Ensuring that society, not corporations, sets the agenda.
- Digital inclusion – Bridging divides so all citizens benefit.
- Open data & interoperability – Creating a shared digital infrastructure for collaboration.

A Collaborative Journey

This document outlines a practical, phased roadmap—from foundational steps in 2025 to a fully integrated Citiverse by 2030. Success depends on partnership: between government, businesses, academia, and, most importantly, Rotterdam's citizens.

We invite every stakeholder—residents, innovators, policymakers, and investors—to join us in co-creating this future. The Citiverse is more than a smart city initiative; it is our blueprint for a better urban life.

The time to act is now. Let's build the future—together.



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List of Abbreviations

AI	Artificial Intelligence
AR	Augmented Reality
CRM	Customer Relationship Management
DT	Digital Twins
ERP	Enterprise Resource Planning
HPC	High-performance Computing
IoT	Internet of Things
IT	Information Technology
KPIs	Key Performance Indicators
LTE	Long-term Evolution
OUP	Open Urban Platform
UDTs	Urban Digital Twins
UN	United Nations
VR	Virtual Reality



Executive Summary

Vision and Purpose

Rotterdam's Citiverse is a groundbreaking initiative to fuse the city's physical, social, and digital layers into an inclusive, sustainable urban ecosystem. Built on Rotterdam's legacy of resilience, innovation, and collaboration, the Citiverse empowers citizens, businesses, and government to co-create a smarter, greener, and more inclusive city.

Core Principles

- Citizen-First Approach – Technology serves societal needs, not the other way around.
- Open & Interoperable – Public data, shared standards, and collaborative governance.
- Inclusive by Design – No one left behind in the digital transition.
- Sustainable & Resilient – Climate adaptation, circular economy, and efficient resource use.

Strategic Objectives

- For Citizens: Better services (including more control of their own data), safer neighbourhoods, and direct participation in urban planning.
- For Businesses: New economic opportunities, streamlined operations, and a thriving innovation hub.
- For Government: Data-driven decision-making, transparent governance, and future-proof infrastructure and compliance by design.

Key Building Blocks

The Citiverse is structured around 12 pillars, including:

1. Circular Economy – Optimizing resource flows and waste reduction
2. Adaptive Infrastructure – climate-proof and resilient vital infrastructures
3. Port Economy – Accelerating maritime tech and collaboration
4. Future of Work and Skills – Bridging workforce gaps through digital learning
5. Youth-Led Innovation – Empowering young creators to shape the city's future
6. Digital Identity and Autonomy – Secure, self-sovereign identity management
7. Security and Crime– Combating digital crime and misinformation
8. Social Entrepreneurship – Aligning businesses with social needs
9. Preventative Healthcare – Preventative healthcare via digital twins
10. Citizen-Centric Government Services – Co-designed public sector solutions
11. Citizen-centred Public Spaces – Community-driven, liveable, digital and physical public spaces
12. Sustainable Spatial Development – Co-designed, data-guided, low-carbon urban growth

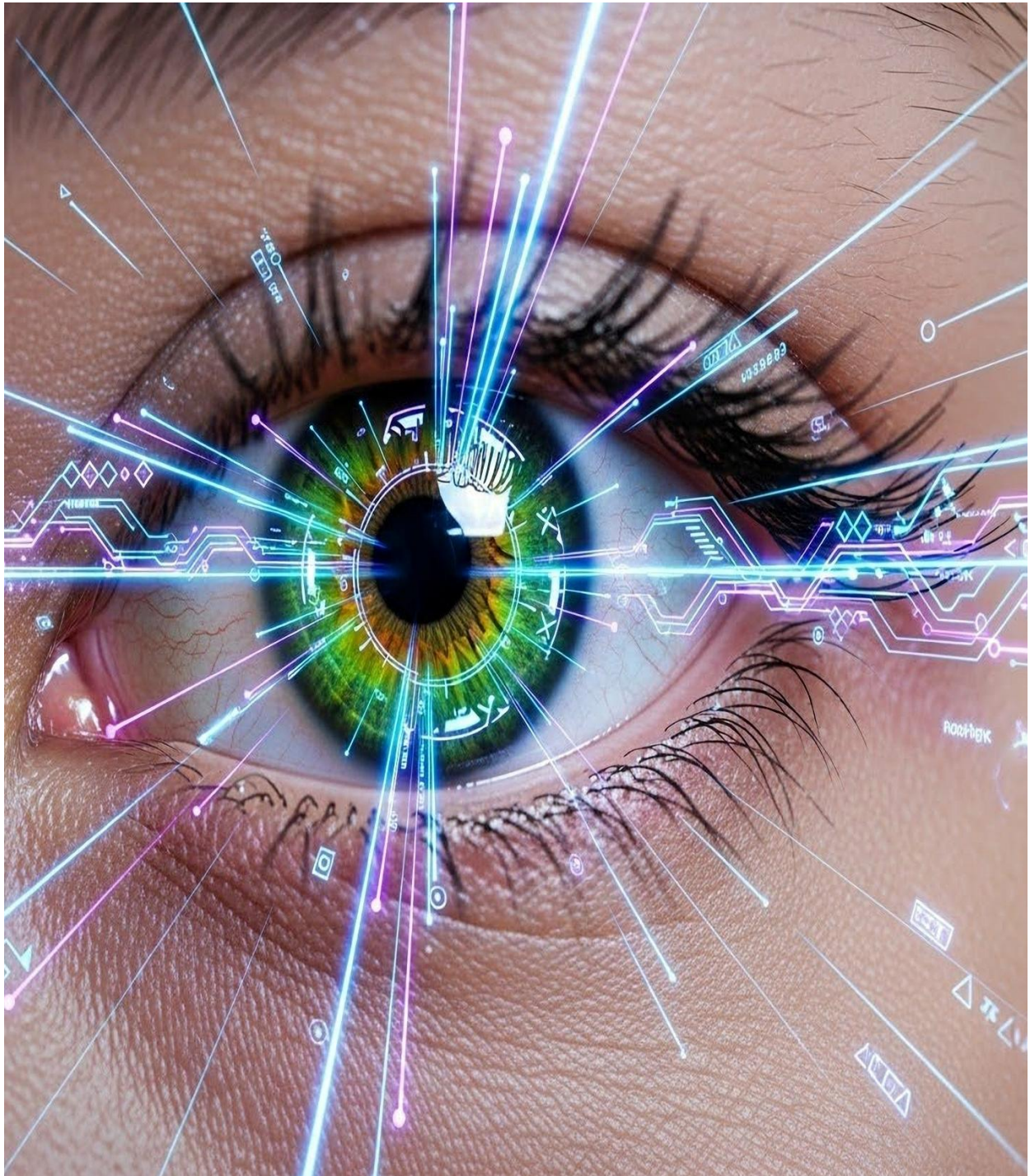
Implementation Roadmap

- 2025: Launch core platforms (Open Urban Platform, Digital Twin) and pilot citizen co-creation projects.
- 2026–2027: Scale successful pilots, enforce data interoperability, and expand international partnerships.
- 2030: Achieve full integration—autonomous port operations, climate-neutral districts, and seamless digital-physical services.

Why It Matters

The Citiverse positions Rotterdam as a global leader in human-centric urban transformation, turning challenges like climate change and inequality into opportunities for collaborative, tech-enabled solutions. By prioritizing trust, equity, and shared ownership, Rotterdam ensures its digital future reflects the values of its people. We believe it is better to proactively shape change than to be forced into inevitable transformation, ensuring we can effectively manage its impact.

The Time to Act Is Now – Join us in building a city that works for all.





1. Introduction

Cities around the world stand at a critical juncture, facing unprecedented challenges from climate change, digital disruption, and growing inequality. At the same time, rapid technological advancements present extraordinary opportunities to reimagine urban life. Rotterdam, with its historic spirit of resilience and innovation, is pioneering a bold response to these challenges through its Citiverse initiative.

The Rotterdam Citiverse represents a transformative vision for the city's future – one where the physical, social and digital dimensions of urban life converge to create a more inclusive, sustainable and empowering urban ecosystem. More than just a technological upgrade, the Citiverse is a fundamental rethinking of how a city can function in the 21st century, putting citizens at the centre of digital transformation while maintaining Rotterdam's distinctive character and values.

This initiative builds on Rotterdam's proud legacy as a city that constantly reinvents itself. From rebuilding after World War II to becoming Europe's largest port, Rotterdam has always demonstrated remarkable adaptability and forward-thinking. The Citiverse continues this tradition by harnessing cutting-edge technologies like digital twins, AI and IoT, but does so with a firm commitment to public values, open standards and democratic control.

What makes Rotterdam's approach unique is its emphasis on co-creation and social impact. Unlike many "smart city" projects driven primarily by technology companies, the Citiverse is being developed by and for Rotterdammers. It's about using digital tools to strengthen communities, improve quality of life, and tackle pressing challenges like climate adaptation and social inequality.

As this document outlines, realizing the Citiverse vision requires careful planning across multiple dimensions – from technological infrastructure to governance models, from digital inclusion to sustainable development. The following pages present a comprehensive roadmap for how Rotterdam will navigate this transformation while staying true to its core principles of pragmatism, inclusivity and bold innovation.

The Citiverse represents both an ambitious goal and a call to action. Its success depends on the active participation of all stakeholders – citizens, businesses, civic organizations and government agencies working together to shape Rotterdam's next chapter. We invite you to join us in this exciting journey to build a city that's not just smarter, but more liveable, resilient and inclusive for generations to come.





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- Weather Sport News Video
- Audio Technics Files
- Electronics Shopping Design
- Mail Internet Maps Radio
- TV Work Travel Tech
- Entertainment Security
- Global Music Companies
- Songs Graphics Vacancy
- Job Data Games People

MAP NAVIGATION



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2. Objectives

The Metaverse Institute will:

1. Develop a draft vision and strategy for Rotterdam on its Citiverse Strategy, identify key challenges and opportunities;
2. Find out what are the key building blocks for the Citiverse project for the next 2,5 years,
3. Create a process, with the right questions to be answered and a timeline, for building up the right insights for each building block, based on the research and experiments in the Community of Knowledge with Community of Practices
4. Understand what elements would need for people to adopt the strategy
5. Help to convince senior politicians and key stakeholders especially citizens that this is something they want to get involved in.
6. Develop the Rotterdam definition of the Citiverse in collaboration with all the key stakeholders
7. Develop a holistic stakeholders engagement plan as part of the building block identification. Plan of Approach with timeline to organize a process to retrieve the needed insights from the Community of Knowledge and Community of Practice to 'fill' the building blocks.
8. Develop the first Draft of Rotterdam Citiverse strategy incorporating existing operating models of three layers, including data sources, users of data and applications, digital infrastructure to create and connect all the data sources and data users within the city, which leads to open interoperable data operating system
9. As part of the strategy, define and set up achievable targets for vision, strategy and high-level implementation plans for the short term (2025), medium term (2026 -2027), long term vision (2030)

Develop an innovation management process to support the collaboration between the strategy, the innovation team and the implementation teams. It is also about connecting strategy and operational, especially about connecting innovation to the 'standing' organisation.





Plan A

Plan B

Plan C

Plan D



- A THERE WAS SOMETHING ABOUT THE WAY... NOTHING WAS THERE Y... THE ONE THE GREAT... NOTHING WAS... THERE Y...
- B I'D DON'T... DON'T THE... NOTHING WAS... THERE Y... THE ONE THE GREAT... NOTHING WAS... THERE Y...
- C WE HAD A THE ONE IN... THE ONE THE GREAT... NOTHING WAS... THERE Y... THE ONE THE GREAT... NOTHING WAS... THERE Y...
- D I'D DON'T... DON'T THE... NOTHING WAS... THERE Y... THE ONE THE GREAT... NOTHING WAS... THERE Y...

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1st 2nd 3rd 4th 5th

3. Vision Statement

Rotterdam envisions its Citiverse as a dynamic, inclusive, and sustainable urban ecosystem where the physical, social, and digital realms converge to empower citizens, foster innovation, and enhance the quality of life for all.

This vision builds on Rotterdam's resilient spirit and its commitment to a "Next Economy" that is both digitally advanced and deeply human-centric. The vision is rooted in Rotterdam's unique "DNA" of resilience and innovation. The city's people are renowned for their vision, strength, courage, and persistence, which is central to their identity as "Rotterdamers". Furthermore, Rotterdam's "inventiveness and DNA for hard work and experimenting" are recognized as key attributes. Therefore, the vision statement for the Citiverse is crafted to resonate with this strong local identity, making it more compelling and relatable for local stakeholders, particularly citizens, and fostering a sense of shared purpose and pride in the initiative.





4. Defining Rotterdam's Citiverse

To ensure broad acceptance, relevance, and a shared understanding, Rotterdam's definition of the Citiverse have been developed collaboratively with all key stakeholders, reflecting the city's unique context and aspirations. Rotterdam has already redefined itself as a "social-physical-digital" city, where residents move seamlessly between physical and digital spaces. This specific, locally tailored interpretation of the Citiverse highlights that technology serves societal and physical needs, rather than being an end in itself. This perspective provides a clear, actionable framework for all subsequent strategic decisions, ensuring that technological deployments are always evaluated through this integrated lens.

The municipality's approach to digital transformation is guided by three important principles: "Society, not big tech, determines the course," "Digital inclusion: No one left behind," and "Data belong to everyone". These principles underscore a commitment to public ownership and open standards, which are non-negotiable for Rotterdam's Citiverse. Based on feedback from key stakeholders through in-depth interviews. The following definition is recommended for Rotterdam, as indicated in Figure 1.

"Rotterdam's Citiverse is a citizens-first, social, physical, digital ecosystem that stands in and embrace of interoperability practices, like open standards, public-private governance and citizen co-creation to transform urban governance, planning, and services—ensuring an inclusive, sustainable, data-driven future for all".

Rotterdam's CitiVerse is a public-first, social, physical, digital ecosystem that combines open standards, and citizen co-creation to transform urban governance, planning, and services—ensuring an inclusive, data-driven future for all.



Public-first – Prioritizing government services, urban planning, and citizen engagement.



Interoperable – Built on open standards (GAIA-X, EU Data Spaces, EU Local Digital Twins-toolbox).



Digital-physical-social – Integrating AI, and digital twins for real-time decision-making.



Citizen-co-created – Ensuring inclusivity through participatory design.

Figure 1: The definition of the Rotterdam Citiverse

5. Value Proposition

The Citiverse will serve as a powerful catalyst for achieving specific strategic objectives, delivering tangible value across all segments of Rotterdam's society. The value proposition for Rotterdam's Citiverse extends beyond simply delivering services to citizens; it is fundamentally about enabling citizens and other stakeholders to co-create the city's future. This transforms the narrative from a top-down technology deployment to a collaborative, empowering ecosystem, which is critical for long-term adoption and genuine civic engagement.

For Citizens:

- **Enhanced Quality of Life:** Citizens will experience improved public services, reduced commute times, and better air quality. The Citiverse will simplify administrative tasks, offering virtual services for housing and transportation planning, and ensuring more efficient resource utilization for water and energy.
- **Better Participation & Engagement:** The Citiverse will allow citizens to explore planned urban projects before they are built, participate in virtual town halls, and even test solutions to reduce traffic and pollution from their devices. They will gain better insight and have a direct say in future projects through interactive 3D models and simulations. Residents can connect with the city in new ways, visualize changes in their environment, provide feedback, and actively co-create solutions. Digital platforms and feedback loops will empower citizens to contribute meaningfully.
- **Increased Safety & Security:** AI-driven surveillance, emergency response systems, and predictive policing will enhance public safety. Smart street lighting, for instance, can adjust to ambient conditions and pedestrian presence, improving safety while conserving energy.
- **Digital Inclusion:** The strategy aims to ensure equal access to services and opportunities for all citizens, actively working to bridge the digital divide.

For Businesses & Economy:

- **Economic Growth:** The Citiverse will attract investments, foster innovation, and create new job opportunities, particularly in technology and infrastructure sectors. Rotterdam's "Next Economy" aims to create 3,500 to 7,000 new jobs through circular economy initiatives.
- **Operational Efficiency:** Businesses will benefit from streamlined processes and reduced operational costs through automation and data-driven decision-making. This includes optimized port operations and predictive maintenance, as demonstrated by the Port of Rotterdam's digital twin initiatives.
- **Innovation Ecosystem:** The Citiverse will foster collaboration opportunities and new revenue models, serving as a "Living Lab" for digital transformation and leveraging data to develop scalable pilot projects.

For City planners:

- **Smarter Urban Planning:** The city can use AI to reduce congestion, improve air quality, and make more informed decisions. Real-time diagnostics will provide insights into the sustainability footprint of infrastructure operations, optimizing the planning and operation of urban infrastructures.
- **Enhanced Decision-Making:** Data-driven insights, predictive analytics, and machine learning will enable more effective and efficient decision-making. Digital twins will facilitate simulations and optimization for urban planning.
- **Transparency & Accountability:** Digital platforms will foster trust by providing citizens with clear

and accessible information about city operations, supported by open data initiatives.

- Sustainability Goals: The Citiverse will aid in monitoring and reducing carbon emissions, as seen in Helsinki's digital twin use, and contribute to achieving climate neutrality goals for specific areas like Schouwburgplein by 2030.

When presenting this to senior politicians, the value proposition must translate abstract technological concepts into tangible, measurable benefits that align with their mandates. Digital twins have proven their transformative potential in cities worldwide—Singapore averted millions in flood losses, Detroit reduced crime by 50% through smart surveillance, Guangzhou cut severe newborn jaundice cases by nearly half using AI-powered health monitoring, and Helsinki achieved 30% lower CO₂ emissions through participatory 3D urban planning. These measurable successes demonstrate how Rotterdam's Citiverse can deliver concrete benefits: cost savings, safer communities, healthier citizens, and accelerated climate action—all while engaging residents in shaping their city's future. The technology exists; the results are documented; now is Rotterdam's moment to lead the next wave of human-centric urban transformation.





6. Challenges and Opportunities

Rotterdam's journey towards a comprehensive Citiverse is marked by both significant achievements and notable challenges, alongside compelling opportunities for future growth.

Challenges:

- **Digital Inclusion Gap:** A persistent challenge is ensuring that digital solutions are truly inclusive and do not exacerbate existing inequalities or create a new divide between tech-savvy individuals and those less comfortable with digital tools. Addressing digital literacy disparities remains critical.
- **Trust and Participation:** There is evidence of existing distrust in the municipality and a perception among some citizens that participation processes might lead to predetermined outcomes. Sustaining public confidence requires unwavering transparency and accountability in the use of data, content, and algorithms.
- **Internal Integration:** While the Open Urban Platform (OUP) aims to connect systems, the challenge of integrating previously siloed smart city projects and ensuring true data interoperability through a "shared language" across diverse systems remains complex. The Slotboomplein pilot revealed "limited integration within municipality" in digital projects.
- **Funding Models:** A notable challenge is that Rotterdam currently lacks dedicated funding mechanisms specifically for innovation capacity, potentially limiting the scalability and breadth of future initiatives.
- **Overcoming Organizational Silos:** Urban Digital Twins (UDTs) can sometimes inadvertently reflect existing organizational silos and municipal priorities, potentially hindering genuine cross-domain collaboration within the city government.
- **Privacy and Security:** Addressing the inherent privacy threats associated with pervasive monitoring and extensive data collection within the Citiverse.
- **Sustainability of Digital Infrastructure:** Ensuring the development of an energy-efficient and "green" metaverse, minimizing its environmental footprint.
- **Capacity Building:** Bridging identified gaps between the practical needs of civic engagement and the current academic and infrastructural capacity to support it effectively.

Opportunities:

- **Open Urban Platform (OUP) as a Catalyst:** Leveraging the Open Urban Platform as a "digital highway" to facilitate seamless data exchange and foster the development of diverse applications for businesses, citizens, and municipal services.
- **Advanced Technologies:** Further integrating AI-driven projects, digital identity solutions, and data wallet functionalities into the Citiverse ecosystem.
- **International Collaboration:** Expanding and deepening international collaborations with other leading cities to share best practices, co-develop solutions, and contribute to global standards.
- **Predictive Analytics:** Maximizing the utilization of the Digital Twin for advanced simulations, scenario analyses, and predictive analytics to inform urban planning and policy, especially for climate adaptation and mobility.
- **Refined Engagement:** Strengthening citizen engagement strategies through iterative learning from pilot projects and applying the "Right to the Smart City" framework to foster genuine empowerment and emancipation.
- **Ecosystem Expansion:** Deepening and expanding the existing "Triple Helix" model of collaboration among public, private, and academic sectors to drive innovation and resource pooling.
- **Data Sovereignty:** Continuing to develop and implement its own AI model to ensure local control

over data, mitigating reliance on external tech giants.

- European and Global Alignment: Aligning with European Digital Infrastructure Consortium for Networked Local Digital Twins towards the CitiVerse, global CitiVerse initiatives from the United Nations to contribute to and benefit from normative frameworks and international best practices.

The comprehensive review reveals a paradox: while technology is positioned as the primary solution for urban challenges, its implementation simultaneously introduces or amplifies complex social and governance challenges (digital divide, trust deficits, integration hurdles). This highlights that the "CitiVerse" is not solely a technological deployment but a profound socio-technical transformation.





7. Building Blocks

As Rotterdam advances toward becoming a global leader in urban digital transformation, its Citiverse strategy is structured around 12 foundational building blocks. These interconnected pillars combine cutting-edge technology with citizen-centric design to create a seamless, sustainable, and inclusive digital-physical ecosystem.

From optimizing the circular economy to safeguarding digital identity, each building block addresses a critical dimension of urban life while reinforcing Rotterdam's broader goals of climate resilience, economic innovation, and social equity. By integrating AI, digital twins, and immersive technologies, these blocks enable:

- Smarter decision-making through real-time data and simulations
- Deeper citizen engagement via co-creation and participatory governance
- Efficient resource use in industries, infrastructure, and public services
- Inclusive growth by bridging digital divides and empowering communities

The 12 building blocks are designed to work synergistically, ensuring Rotterdam's Citiverse isn't just a collection of technologies, but a unified platform for sustainable urban transformation. Below, we explore each pillar's role in shaping a city where digital and physical worlds converge to improve lives, foster innovation, and future-proof Rotterdam for generations to come.

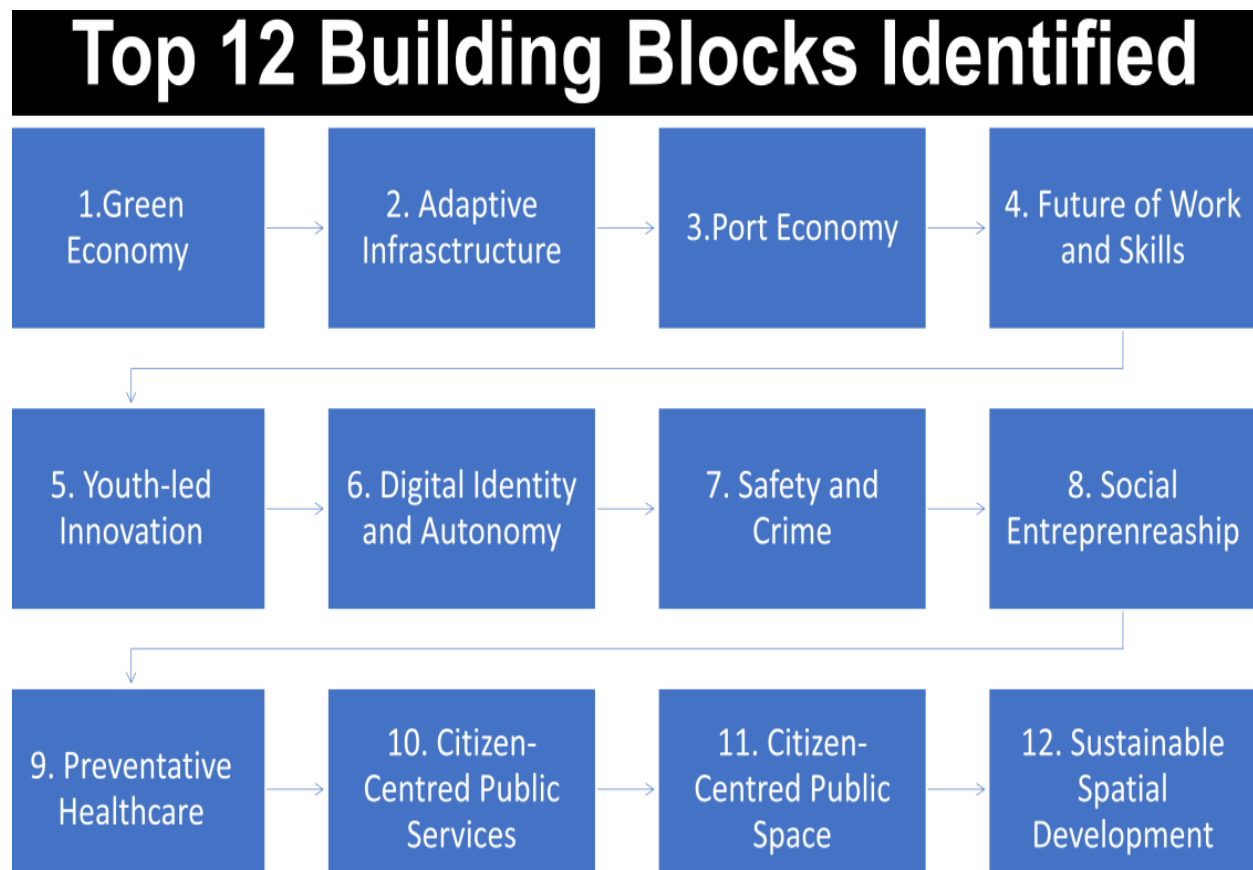


Figure 2: 12 building blocks for the Rotterdam Citiverse

The 12 Building Blocks at a Glance, as indicated in Figure 2:

1. Circular Economy – Optimizing resource flows and waste reduction
2. Adaptive Infrastructure – climate-proof and resilient vital infrastructures
3. Port Economy – Accelerating maritime tech and collaboration
4. Future of Work and Skills – Bridging workforce gaps through digital learning
5. Youth-Led Innovation – Empowering young creators to shape the city's future
6. Digital Identity and Autonomy – Secure, self-sovereign identity management
7. Security and Crime– Combating digital crime and misinformation
8. Social Entrepreneurship – Aligning businesses with social needs
9. Preventative Healthcare – Preventative healthcare via digital twins
10. Citizen-Centric Government Services – Co-designed public sector solutions
11. Citizen-centred Public Spaces – Community-driven, liveable, digital and physical public spaces
12. Sustainable Spatial Development – Co-designed, data-guided, low-carbon urban growth

This framework ensures Rotterdam's Citiverse is adaptive, inclusive, and purpose-driven – a model for cities worldwide. Each block includes phased milestones (2025–2030) with clear Key Performance Indicators (KPIs), ensuring measurable progress toward a city that's not just smarter, but more liveable, resilient, and equitable.





8. Operating Model: The Open Urban Platform

A well-defined operating model is essential to manage the complexity of the Citiverse, ensuring seamless data flow, processing, and service delivery. This model aligns with established smart city architectural frameworks, structured in interconnected layers to support the entire data lifecycle—from collection to application.

At the heart of Rotterdam's Citiverse operating model lies the Digital Twin (as demonstrated in Figure 3), which serves as a dynamic, common and shareable view of the city's physical reality. Rather than acting as a singular "point of truth," the Digital Twin synthesizes diverse stakeholder perspectives with real-time data, acknowledging that each actor in the ecosystem perceives and interacts with the urban environment differently. By integrating these multiple viewpoints with authoritative data about the physical world, the Digital Twin fosters collaboration and informed decision-making across the Citiverse.

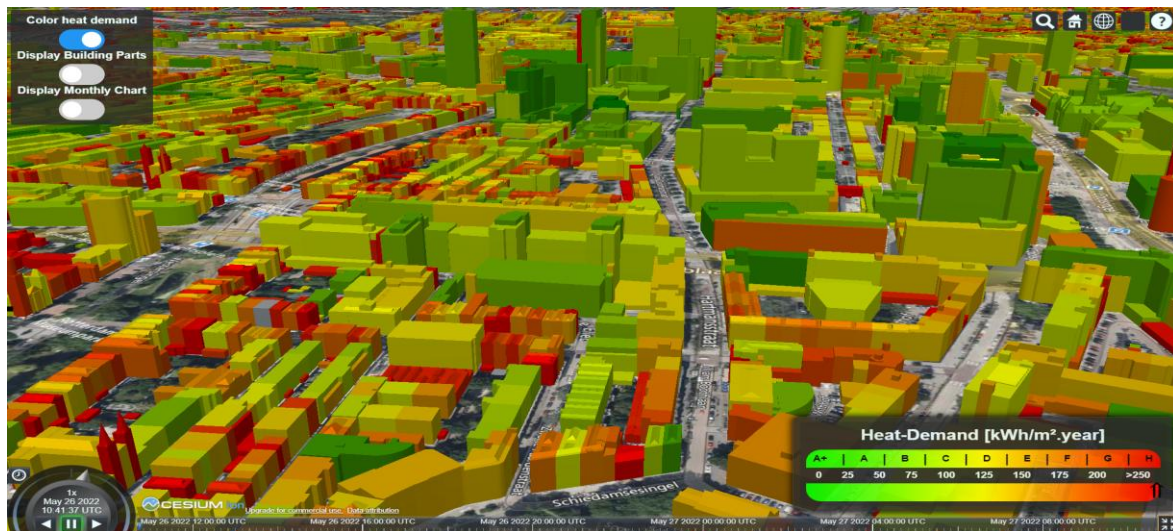


Figure 3: Using the 3D city model to calculate energy savings potential.

Three-Layered Operating Model

1. Layer 1: Perception/Data Sources Layer
This foundational layer collects raw data from the physical environment through sensors, IoT devices, and other sources, providing the essential inputs for the Digital Twin.
2. Layer 2: Digital Infrastructure/Data Processing Layer
Here, raw data is transformed into actionable insights through connectivity, storage, and advanced processing. The Open Urban Platform (OUP) operates at this layer, ensuring seamless data exchange and interoperability across city domains.
3. Layer 3: Application/Services Layer
The topmost layer delivers tangible services and applications to end-users—citizens, businesses, and city officials—leveraging processed data to drive innovation and efficiency.

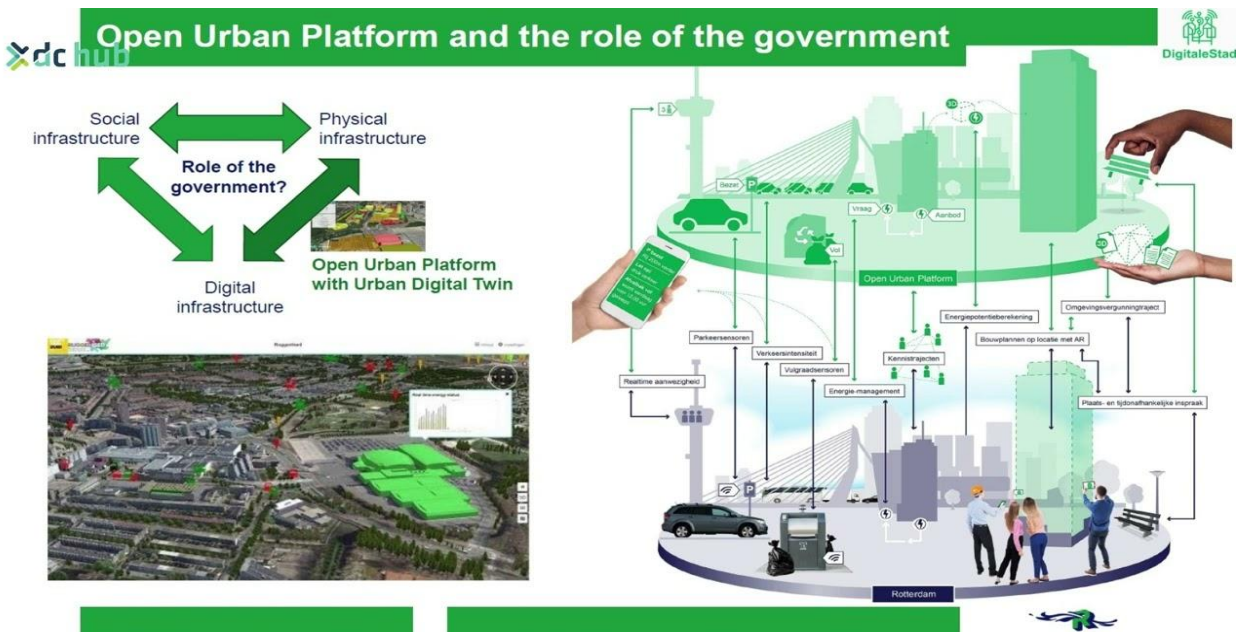


Figure 4: The Opening Urban Platform and the role of the government

The Open Urban Platform (OUP) forms the backbone of Rotterdam’s digital infrastructure, enabling responsible data reuse and sharing across stakeholders. By adhering to FAIR principles (Findable, Accessible, Interoperable, and Reusable), the OUP ensures data is not only available but also adaptable to diverse use cases. Rotterdam’s vision is a fully integrated, open data ecosystem—a citywide digital operating system that empowers businesses, academia, civil society, and residents to collaborate in shaping the Citiverse. This is demonstrated in the following Figure 5.

Layer Name	Key Components	Role/Function	Users/Actors
1. Perception/Data Sources Layer	IoT sensors, actuators, wearables, cameras, existing information systems (ERP, CRM)	Collects real-time data from the physical environment (traffic, air quality, energy consumption, human movement)	Physical environment, various city assets, citizens (as data generators)
2. Digital Infrastructure/Processing Layer	5G/LTE/Wi-Fi networks, gateways, edge computing, cloud platforms (data lakes, data warehouses), HPC infrastructure, Open Urban Platform (OUP)	Ensures continuous data transfer; processes, stores, and transforms raw data into actionable insights; enables interoperability and data sharing	City departments, IT teams, data analysts, external partners
3. Application/ Services Layer	Citizen-facing mobile apps, online portals, dashboards, visualization tools, AI-powered systems (e.g., smart traffic, e-governance), Digital Twin interfaces, AR/VR platforms	Delivers services and applications to end-users; improves urban living; enables participatory decision-making; provides user-friendly interfaces	Citizens, businesses, city officials, urban planners, emergency services

Figure 5: The three layered architecture for the Rotterdam Citiverse



9. Stakeholder Engagement

Successful Citiverse implementation requires deep, continuous engagement with a diverse range of stakeholders, fostering co-creation and shared ownership. Building trust and ensuring widespread citizen adoption are critical for the long-term success and legitimacy of the Citiverse. Effective stakeholder engagement is critical for successful urban development initiatives, ensuring that initiatives align with the needs and expectations of the populace and leading to more inclusive decisions.

Citizens and Communities

Rotterdam will empower residents through virtual town halls and participatory design workshops using digital twin technology, creating multiple touchpoints for meaningful involvement in shaping the Citiverse. Mobile feedback applications and neighbourhood forums will capture diverse perspectives while digital literacy programs ensure all communities can fully participate. Citizen science initiatives will give residents hands-on roles in testing and improving solutions, reinforcing that their contributions directly enhance urban life and services.

Senior Politicians and City Leaders

Regular strategic briefings with progress dashboards will demonstrate how Citiverse delivers on Rotterdam's priorities, supported by showcase events highlighting successful pilots and their measurable impacts. Direct consultation sessions will address concerns and align digital transformation with political agendas, while risk mitigation frameworks maintain confidence in the initiative's responsible governance. This ongoing dialogue ensures Citiverse remains a strategic priority with sustainable funding and policy support.

Businesses and Private Sector

The city will cultivate innovation through structured public-private partnerships and annual challenges that incentivize solutions for urban challenges, particularly focusing on supporting SMEs in their digital transition. Industry-specific workshops and investor forums will connect companies with Citiverse opportunities, while clear data sharing protocols create mutual value. Rotterdam's living lab environment offers businesses unique testing grounds for solutions with global market potential within Europe's most advanced port digital ecosystem.

Academia and Research Institutions

Long-term research partnerships will connect theoretical expertise with practical urban challenges, facilitated through campus innovation labs and knowledge transfer programs. Students and researchers will work with real-world Citiverse data sets, applying academic rigor to validate approaches while gaining unparalleled experience in urban digital transformation. This collaboration ensures Rotterdam benefits from cutting-edge research while academia contributes to shaping the ethical and technical foundations of future cities.

Internal City Staff and Departments

Cross-functional digital transformation teams will break down silos as comprehensive training programs equip staff with new tools for public service innovation. Regular innovation sprints and idea management platforms will capture frontline insights, while involvement in pilot projects gives departments ownership of the change process. This internal engagement turns city employees into ambassadors for Citiverse, applying their operational knowledge to improve both services and workplace efficiency.

Implementation Approach

A Stakeholder Advisory Council representing all groups will guide quarterly engagement cycles, supported by an integrated digital platform that ensures transparent communication and tracks collaborative progress. Biannual impact reviews will refine approaches based on measurable outcomes and qualitative feedback, creating a responsive framework that evolves with Rotterdam's digital transformation journey while maintaining focus on shared goals and collective benefits. Figure 6 outlines a holistic stakeholder engagement plan, mapping audiences, objectives, and methods.

Stakeholder Group	Key Objectives	Engagement Methods	Key Messages
Citizens & Communities	Build trust; foster co-creation; ensure digital inclusion; drive adoption	Virtual town halls; participatory design workshops (using DT); mobile apps for feedback; digital literacy training; community forums; citizen science initiatives	"Your city, co-created by you"; "Your data is safe and empowers better services"; "Citiverse enhances your daily life and future"
Senior Politicians & City Leaders	Secure political endorsement; ensure sustained funding; align with city's strategic goals; manage perceived risks	Strategic briefings; progress reports with KPIs; showcasing pilot project successes; direct consultations; risk mitigation presentations	"Citiverse: A strategic investment for a resilient, sustainable, and competitive Rotterdam"; "Responsible innovation, public control"; "Tangible benefits for our citizens and economy"
Businesses & Private Sector	Foster innovation; attract investment; create new economic opportunities; encourage data sharing & collaboration, focus on SMEs who are digitally emerging	Public-Private Partnerships (PPPs); innovation challenges; industry workshops; data sharing agreements; investment forums	"Unlock new markets and efficiencies through Rotterdam's open digital ecosystem"; "Collaborate for shared prosperity"; "Rotterdam: A hub for digital innovation"
Academia & Research Institutions	Leverage expertise; foster R&D; develop talent; validate methodologies	Joint research programs; knowledge transfer partnerships; innovation labs; expert consultations; student projects	"Contribute to cutting-edge urban research"; "Shape the future of urban living"; "Access real-world data for impactful studies"
Internal City Staff & Departments	Build capacity; foster innovation; ensure cross-departmental collaboration; manage change	Innovation training; cross-departmental teams; idea management systems; regular internal communications; pilot project involvement, structural use of user experience/interface	"Empowering you with new tools for better public service"; "Your ideas drive our digital future"; "Working together for a smarter Rotterdam"

Figure 6: A holistic stakeholder engagement plan for Rotterdam's Citiverse



MILESTONE

10. Timeline and Targets

A clear, phased timeline with achievable targets is essential for guiding the implementation of Rotterdam's Civerse strategy, ensuring accountability, and demonstrating tangible progress to all stakeholders.

Short-Term Milestones (2025)

The focus for 2025 will be on operationalizing foundational elements, showcasing initial successes, and strengthening core infrastructure. The city's Open Urban Platform (OUP) and digital twin are anticipated to be fully operational by the end of 2024. This means 2025 is a year for initial operationalization and showcasing. Leveraging this existing momentum to build early wins and trust is crucial. The observation that uncertainty about citizen input use can lead to scepticism implies that the short-term focus for 2025 should be on showcasing tangible, citizen-facing applications built on the operational OUP and digital twin. These early wins, coupled with transparent communication about how citizen input is integrated, will be crucial for building trust and momentum for broader adoption.

Medium-Term Goals (2026-2027)

The medium-term period will focus on expanding successful pilots, integrating more diverse data sources, and scaling up citizen-centric applications across the city. Scaling requires a focus on interoperability and standardized data models. As more applications and data sources are integrated, the challenge of "disparate data formats and schemas" will intensify. The current focus on Minimal Interoperability Mechanisms (MIMs) and Pivotal Points of Interoperability (PPIs) is a strong start, but scaling will test its robustness. Therefore, medium-term goals must include dedicated efforts to enforce data standards and interoperability across all new and existing systems. This involves developing common ontologies and data models to ensure that data from different sources can be seamlessly combined and reused, preventing the creation of new data silos as the Civerse expands. Also focus on user experience and user interface to enhance inclusive services for, and participation and co-creation of citizens.

Long-Term Vision (2030)

By 2030, Rotterdam aims to achieve a fully integrated, human-centric Civerse that significantly contributes to its long-term sustainability and resilience goals. The Civerse is a means to achieve broader city-wide strategic goals, not an end in itself. The long-term targets (autonomous port, climate neutrality, Next Economy, resilience) are deeply embedded in Rotterdam's existing strategic documents. The Civerse serves as the enabler for these ambitious goals. Therefore, the long-term vision for the Civerse must be articulated in terms of its contribution to Rotterdam's overarching strategic objectives. This reinforces the idea that the Civerse is a critical concept for urban transformation, not just a technological upgrade, and helps maintain sustained political and public support by linking it to widely shared aspirations for the city's future.

Key Performance Indicators

Measuring the success of the Civerse requires a multifaceted approach, encompassing technological, social, economic, and environmental dimensions. KPIs for smart cities are typically divided into three main categories: economy, environment, and society/culture. They also encompass direct benefits (e.g., investment efficiency, smart environment) and indirect benefits (e.g., smart living, smart mobility). KPIs must reflect the "human-centric" and "co-creation" aspects of Rotterdam's Civerse. While traditional smart city KPIs often focus on efficiency and infrastructure, Rotterdam's vision emphasizes citizen participation, digital inclusion, and human-centricity. Beyond technical and economic metrics,

Rotterdam's KPIs should prominently feature indicators related to citizen trust, digital literacy, the diversity of participants in co-creation initiatives, and the perceived quality of life improvements by residents. This ensures that the Citiverse remains aligned with its core human-centric principles and demonstrates success beyond mere technological deployment. Figure 5 provides a concise overview of the phased implementation plan, demonstrating achievable progress and accountability over time.

Timeline	Strategic Goal	Key Targets/Milestones	Linked SDGs	KPIs
Short-Term (2025)	Establish Foundational Infrastructure & Initial Showcases	• OUP & City Digital Twin fully operational • Port Digital Twin enhanced • Initial citizen co-creation experiments • Digital Inclusion Programme expansion • Monthly PPI reports begin	SDG 9 (Industry, Innovation) SDG 11 (Sustainable Cities) SDG 4 (Quality Education)	• % OUP uptime • % citizen engagement in DT pilots • % digital literacy increase • # of PPI reports published
Medium-Term (2026-2027)	Scale Successful Pilots & Deepen Integration	• Rotterdam integrated into Citiverse EDIC (100 cities by 2026) • Expanded DT use cases • Broader rollout of citizen-centric apps • Enhanced data interoperability	SDG 11 (Sustainable Cities) SDG 17 (Partnerships) SDG 10 (Reduced Inequalities)	• % Citiverse EDIC participation • # of new DT use cases • % increase in citizen app users • % data sources with open standards
Long-Term (2030)	Achieve Fully Integrated, Human-Centric Citiverse	• Autonomous Port operations • Climate-neutral urban areas • Circular economy adoption • Fully resilient city systems • Personalized citizen services	SDG 13 (Climate Action) SDG 12 (Responsible Consumption) SDG 8 (Decent Work) SDG 3 (Good Health)	• % autonomous port • % CO₂ reduction • % material reuse • Resilience Index score • % citizen satisfaction

Figure 7: KPIs for short, medium and long term implementation plan for Rotterdam Citiverse





11. Innovation Management Process

An effective innovation management process is vital to bridge the gap between strategic vision, innovative ideas, and their practical implementation within Rotterdam's existing organizational structure. It is crucial for connecting strategy with operational execution, particularly in integrating innovation into the "standing" organization.

Phase 1: Ideation and Problem Definition

The innovation process begins with city-wide challenges, hackathons, and citizen engagement campaigns to identify urban pain points and digital solution opportunities, complemented by research into emerging technologies. Led by Innovation Labs in collaboration with cross-departmental teams, citizens, academia, and technology providers, this phase establishes the foundation for Citiverse by pinpointing specific application areas such as mobility challenges and environmental monitoring needs, ensuring all innovations address real urban priorities from the outset.

Phase 2: Experimentation and Prototyping

Selected concepts progress to controlled prototyping environments where Innovation Labs, technical teams, and citizen co-creation groups develop Minimum Viable Products (MVPs) and conduct pilot projects while gathering diverse user feedback. This critical testing phase validates both the technical feasibility of new Citiverse features (like AR/VR interfaces) and the effectiveness of citizen engagement models within the digital twin framework, ensuring solutions are both technically sound and user-centred before scaling.

Phase 3: Scaling and Implementation

Successful prototypes transition to city-wide deployment through coordinated efforts by implementation teams, city departments, legal/policy teams, and external partners who integrate solutions into the Open Urban Platform while developing necessary governance frameworks. This phase transforms validated concepts into operational reality by ensuring system-wide interoperability, adapting municipal policies for digital services, and establishing the infrastructure for broad adoption across Rotterdam's urban landscape.

Phase 4: Integration and Operationalization

The operational teams, Digital Inclusion Programme, and IT support staff embed mature digital services into daily city operations through comprehensive training programs, ongoing technical support, and long-term maintenance planning. This phase completes the innovation lifecycle by transitioning experimental solutions into reliable municipal services, driving continuous citizen adoption through digital literacy initiatives while fully integrating new capabilities into the city's standing organizational structure.

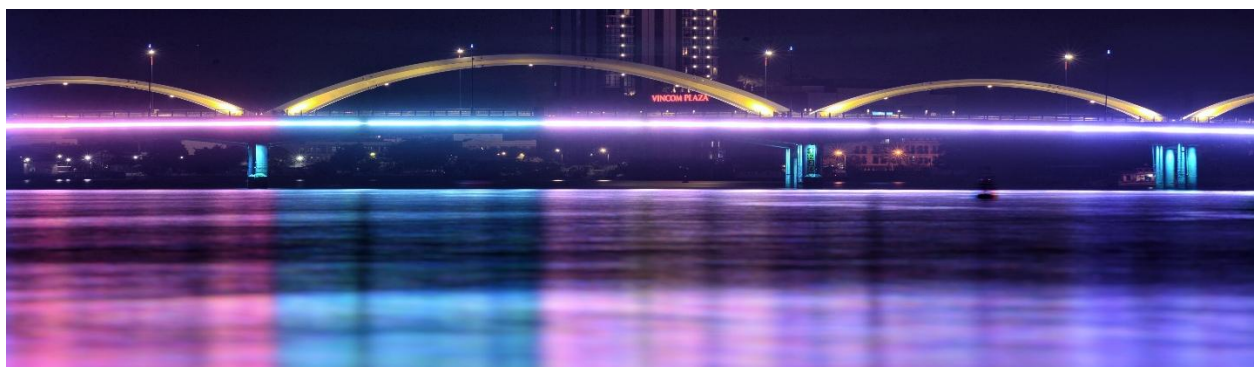
Phase 5: Evaluation and Adaptation

A dedicated strategy team, data analytics unit, Innovation Council, and citizen engagement team maintain continuous improvement through KPI monitoring, policy reviews, impact assessments, and stakeholder feedback collection. This final phase creates a virtuous cycle of learning by measuring Citiverse's impacts on quality of life and sustainability, identifying emerging challenges, and feeding insights back into the innovation pipeline to ensure Rotterdam's digital transformation remains responsive and effective over time.

The following Figure (Figure 8) outlines a structured approach to managing innovation, demonstrating how new ideas are generated, tested, and integrated into the broader Citiverse strategy.

Phase	Key Activities	Responsible Teams/Actors	Link to Citiverse Strategy
1. Ideation & Problem Definition	Conduct city-wide challenges, hackathons, citizen engagement campaigns; identify urban pain points and opportunities for digital solutions; research emerging technologies	Innovation Labs, Cross-departmental teams, Citizens, Academia, Tech providers	Identify new Citiverse application areas (e.g., specific mobility challenges, environmental monitoring needs)
2. Experimentation & Prototyping	Develop prototypes and Minimum Viable Products (MVPs) in controlled environments (innovation labs); conduct pilot projects; gather user feedback from diverse groups	Innovation Labs, Technical teams, Citizen co-creation groups	Test citizen engagement models within the digital twin; validate technical feasibility of new Citiverse features (e.g., AR/VR interfaces)
3. Scaling & Implementation	Scale successful pilots across relevant city departments; integrate new solutions into the Open Urban Platform; develop necessary policy and regulatory frameworks	Implementation teams, City departments, Legal/Policy teams, External partners	Roll out successful Citiverse applications city-wide; ensure interoperability with existing systems; adapt governance for digital services
4. Integration & Operationalization	Embed new digital services to daily city operations; provide ongoing support for staff and citizens; establish long-term maintenance and upgrade plans	Operational teams, Digital Inclusion Programme, IT support, City departments	Ensure seamless functioning of Citiverse components; drive continuous citizen adoption and digital literacy; integrate innovation into "standing organization"
5. Evaluation & Adaptation	Continuously monitor KPIs; conduct regular policy reviews and impact assessments; gather ongoing feedback from all stakeholders; adapt strategy based on learnings	Strategy team, Data analytics unit, Innovation council, Citizen engagement team	Assess Citiverse's impact on quality of life, sustainability, and efficiency; identify new challenges and opportunities for future innovation cycles

Figure 8: Innovation Management Process for Rotterdam Citiverse





12. Future Recommendations

Rotterdam is deeply committed to continuous innovation, actively embarking on a new series of experiments. These initiatives include advanced AI-driven projects, the exploration of digital identity and data wallet solutions, and continued expansion of international collaborations with other pioneering cities. The city's active participation in global initiatives such as The Global Initiative on Virtual Worlds and AI – Discovering the Citiverse, a global multi-stakeholder platform launched by the International Telecommunication Union, the United Nations International Computing Centre, and Digital Dubai, the Horizon2020 program, and its role in the Eurocities Digital Forum indicates a clear ambition that extends beyond local implementation. Rotterdam also actively participates in the Open & Agile Smart Cities (OASC) network, further solidifying its commitment to open standards and collaborative urban development.

A significant recent event was the Imagine conference, held from May 27-28, 2025, in Tampere. This conference served as the official international launch of Rotterdam's Open Urban Platform (OUP), providing a global stage for discussions on digital resilience and public safety within urban contexts. The strategic decision to host the international launch of the OUP at the Imagine conference was a deliberate move to showcase its unique model, share lessons learned, and potentially influence the development of global benchmarks and best practices for urban digital transformation.

Rotterdam's demonstrated leadership in urban planning and development, characterized by its innovative approaches to sustainability, architecture, and infrastructure, showcases how strategic innovation, collaborative ecosystems, and a forward-thinking vision can collectively create a thriving, resilient city for the future. This involves sharing best practices, contributing to normative frameworks, and attracting international talent and investment, further solidifying its reputation as a global hub for urban innovation.

Rotterdam is not just implementing a Citiverse for itself; it is actively positioning itself as a leader and a "living laboratory" for other cities worldwide. This digital transformation is an ongoing process, not a linear project. Our vision for the Rotterdam Citiverse is the next critical step in this continuous evolution, building upon the foundational "Rotterdam in Transformation 1.0" and paving the way for future iterations beyond the 2.0 version. We believe that shaping a city's future is a perpetual journey of innovation and adaptation.



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13. Conclusion

The Rotterdam Citiverse represents far more than a technological upgrade—it is a fundamental reimagining of how our city functions, collaborates, and thrives in the digital age. As we stand on the brink of this transformation, it is clear that the true power of the Citiverse lies not in its algorithms or sensors, but in its ability to empower people, strengthen communities and knowledge institutes and democratize urban innovation.

Rotterdam has always been a city of pioneers and problem-solvers—from our world-leading port to our cutting-edge climate adaptation strategies. The Citiverse continues this legacy by providing a framework where technology serves society, where data becomes a tool for equity rather than exclusion, and where every citizen can help shape the future of their neighbourhoods.

The roadmap ahead is both ambitious and achievable. From establishing foundational digital infrastructure by 2025 to realizing a fully integrated urban ecosystem by 2030, each phase has been designed to deliver tangible benefits while maintaining flexibility to adapt to new challenges and opportunities.

However, technology alone cannot build a better city. The Citiverse's success depends on our collective commitment—the active participation of residents, the creativity of businesses, the dedication of civil servants, and the vision of policymakers. It requires ongoing dialogue, transparent governance, and most importantly, shared ownership of this digital transformation.

As we embark on this journey, we carry forward Rotterdam's enduring values: practical solutions, social solidarity, and bold innovation. The Citiverse is our opportunity to prove that a digital city can be more humane, that data can serve democracy, and that urban technology can amplify rather than diminish our shared humanity.

The future is not something that happens to Rotterdam—it's something we create together. We invite all Rotterdammers to join in building a Citiverse that reflects our city's resilient spirit and delivers on our promise of an inclusive, sustainable and thriving urban future for all.





Appendix: 12 building blocks of the Rotterdam Citiverse

1. Circular Economy

Ambition: We recommend leveraging the Citiverse to model, monitor, and optimize Rotterdam's circular economy initiatives. This includes key areas like waste management, resource recovery, and industrial symbiosis. The platform will simulate policy impacts, identify opportunities for reducing carbon emissions and material waste, and crucially, help match the supply and demand for circular resources across the city.

Short Term (2025): By the end of 2025, Rotterdam will pilot a "Circular Economy Simulation Module" within the Citiverse. This initial phase will focus on optimizing specific waste streams and resource recovery processes. Our goal is to identify immediate efficiency gains, which we'll achieve through the integration of data from key waste facilities and initial scenario modelling.

Medium Term (2026-2027): By 2027, the Citiverse will expand to comprehensively monitor and model industrial symbiosis opportunities across Rotterdam's port and industrial clusters. Our aim is to reduce carbon emissions and material waste by 10% in targeted sectors. This will be realized by integrating real-time resource flow data and facilitating virtual collaboration between enterprises for material exchange.

Long Term (2030): By 2030, Rotterdam's Citiverse will serve as the central, intelligent system for a fully optimized, city-wide circular economy. This ambitious goal will enable continuous simulation, predictive analysis, and dynamic policy adjustments for maximum resource efficiency and minimal environmental impact. We'll achieve this through advanced AI, comprehensive data dashboards, and a collaborative ecosystem for all stakeholders, further enhancing the platform's ability to match supply and demand for circular resources across the entire urban landscape.



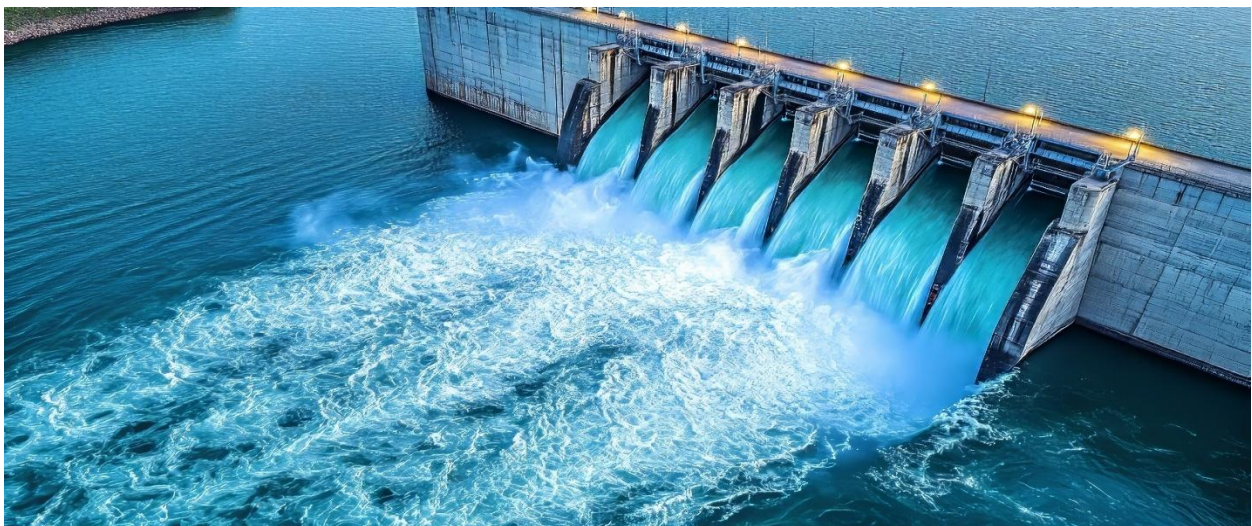
2. Adaptive Infrastructure

Ambition: We recommend leveraging the Citiverse to plan and optimize Rotterdam's adaptive infrastructure projects, understood in the broadest sense to include social, physical, and digital networks. The platform will be crucial for modelling initiatives like floating neighbourhoods, elevated buildings, and dynamic flood defences. The Citiverse integrates cutting-edge data insights—including those from the EU Destination Earth Initiative and Ocean Twin's coastal/marine monitoring systems—to future-proof Rotterdam's infrastructure against climate risks and evolving urban demands. By treating the city as an interconnected ecosystem of critical systems, this approach embodies our organizational philosophy: proactive, holistic, and resilient by design.

Short Term (2025): By the end of 2025, Rotterdam will pilot an "Adaptive Infrastructure Simulation Module" within the Citiverse. This will initially focus on one specific project, such as a floating neighbourhood or a critical digital network upgrade. The aim is to visualize and assess its resilience against initial climate scenarios or potential system shocks, which we'll achieve by integrating foundational geospatial and hydrological data, alongside relevant social and digital infrastructure datasets.

Medium Term (2026-2027): By 2027, the Citiverse will expand to model and optimize a broader range of adaptive infrastructure projects, including dynamic flood defences, resilient social networks, and robust digital communication systems. The goal is to ensure future-proof designs against projected climate impacts and evolving societal demands. This will be achieved by integrating real-time EU Ocean Twin coastal and marine data, along with diverse social and digital infrastructure data for comprehensive scenario planning and interdependencies analysis.

Long Term (2030): By 2030 Rotterdam's Citiverse infrastructure will be the definitive platform for intelligent, data-driven adaptive infrastructure planning across the entire city. It will enable continuous optimization and real-time responsiveness to environmental changes and urban dynamics, spanning all vital social, physical, and digital infrastructures. This will be realized through advanced predictive analytics, seamless data integration across all city systems, and collaborative multi-stakeholder design environments, fostering a truly interconnected and resilient urban fabric and collaborative multi-stakeholder design environments.



3.Port Economy

Ambition: We recommend leveraging the Citiverse as a dynamic, collaborative ecosystem to connect all port stakeholders, including businesses, researchers, and policymakers. This will significantly foster innovation within the port economy and facilitate the co-creation of new technologies, services, and business models. Crucially, the Citiverse infrastructure will also serve as a vital bridge, making connections between the port ecosystem and its surrounding and corresponding urban and regional ecosystems.

Short Term (2025): By the end of 2025, Rotterdam will launch a "Port Innovation Hub" within the Citiverse. This initial phase will connect key port businesses and researchers, enabling initial idea sharing and collaborative problem-solving. This will be implemented through a secure digital workspace and targeted innovation challenges designed to spark cross-stakeholder collaboration.

Medium Term (2026-2027): By 2027, the Citiverse will expand to facilitate the co-creation of new port technologies, services, and business models among a broader range of port stakeholders, extending to include relevant city and regional partners. The aim is to accelerate sustainable port development and strengthen the port-city interface. This will be achieved by integrating virtual prototyping tools, organizing regular collaborative hackathons, and establishing dedicated channels for cross-ecosystem knowledge exchange.

Long Term (2030): By 2030, Rotterdam's Citiverse will offer the central, dynamic platform for continuous innovation and comprehensive cross-stakeholder collaboration within the entire port ecosystem, seamlessly integrated with the broader urban environment. This will enable the rapid development and deployment of future-proof maritime solutions, driving sustainable growth for both the port and the city. This vision will be realized through advanced AI-driven matchmaking, comprehensive data analytics, robust public-private partnership frameworks, and the Citiverse's fundamental role in fostering a truly interconnected innovation landscape across all relevant ecosystems.



4. Future of Work and Skills

Ambition: Use Citiverse as a collaborative platform to connect educators, employers, policymakers, and learners, fostering innovation in education and work. The platform can facilitate co-creation of new curricula, training programs, and workforce solutions.

Short Term (2025): By the end of 2025, Rotterdam will pilot a foundational "Education & Skills Citiverse" platform connecting educational institutions and local businesses, aiming to enhance student project collaboration and facilitate initial skill-matching, implemented through a dedicated task force for platform development and user onboarding.

Medium Term (2026-2027): By 2027, the "Education & Skills Citiverse" will expand to include virtual training modules and employer-led skill development programs, aiming to reduce the local skills gap and increase internship placements, achieved by integrating advanced analytics for skills assessment and fostering partnerships with key industry sectors.

Long Term (2030): By 2030, Rotterdam's "Citiverse" will serve as a fully integrated, city-wide ecosystem for lifelong learning and dynamic workforce development, enabling adaptive education pathways and real-time skill alignment with market demands, realized through continuous technological innovation and robust public-private governance.



5. Youth-Led Innovation

Ambition: Use Citiverse as an ecosystem for youth-led innovation, enabling young people to design and test their ideas for improving the city. The platform can provide tools for prototyping, collaboration, and showcasing projects to policymakers and the public.

Short Term (2025): By the end of 2025, Rotterdam will launch a "Youth Innovation Hub" within the Citiverse, enabling young people to ideate and virtually prototype solutions for urban challenges, implemented through dedicated workshops and a user-friendly digital toolkit.

Medium Term (2026-2027): By 2027, the Citiverse will expand its "Youth Innovation Hub" to facilitate collaborative project development and showcase youth-led solutions to city officials and potential investors, aiming to transition successful virtual prototypes into real-world pilot projects, achieved by integrating mentorship programs and public pitch events.

Long Term (2030): By 2030, Rotterdam's Citiverse will be a self-sustaining, dynamic ecosystem for youth-driven urban innovation, empowering young people to continuously shape the city's future through robust design, testing, and implementation cycles, realized through ongoing platform enhancements and established funding channels for youth initiatives.



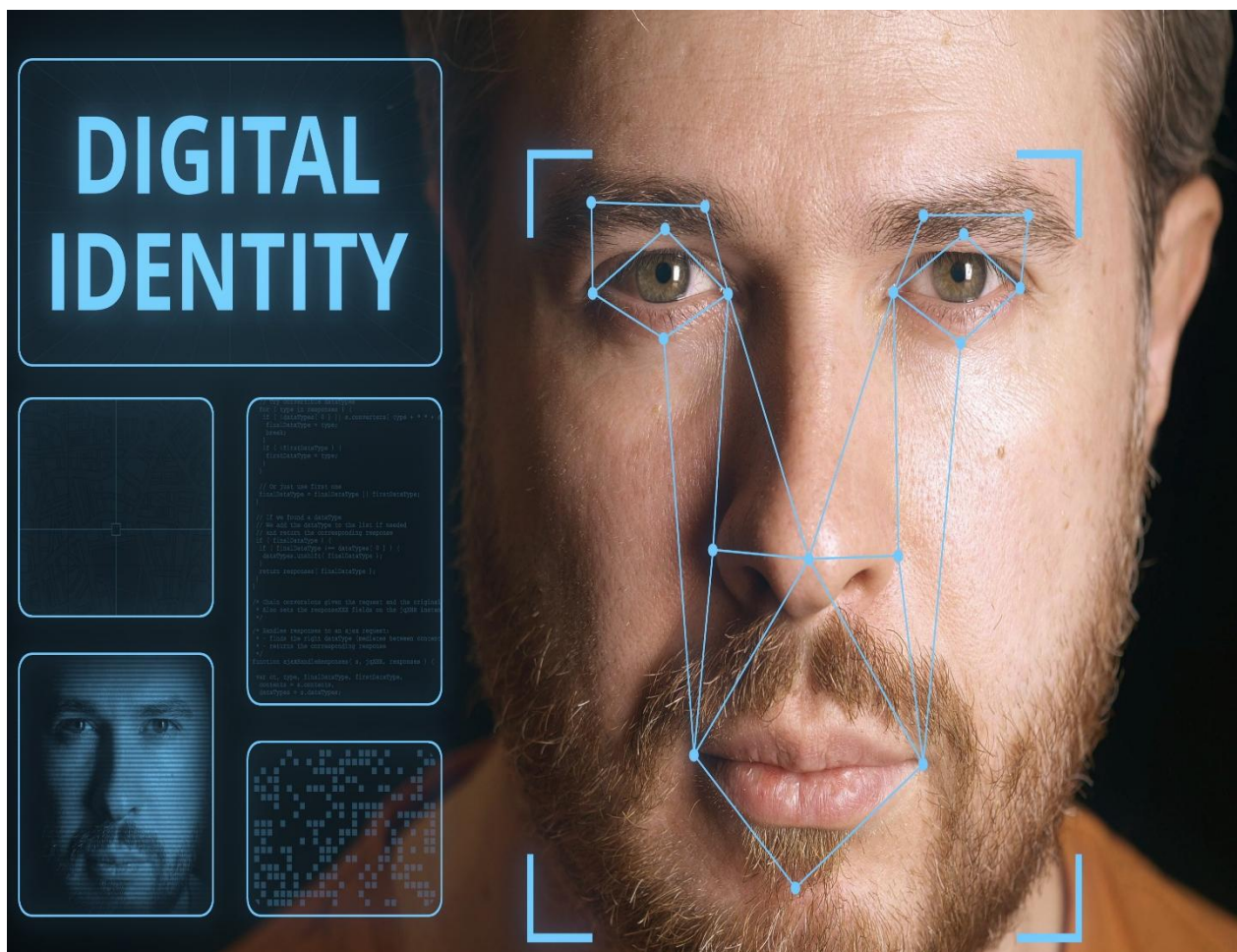
6. Digital Identity and Autonomy

Ambition: Develop a Citiverse concept in which digital identity and autonomy is integrated by design, and support residents to have more control over their personal data and digital credentials.

Short Term (2025): By the end of 2025, Rotterdam will pilot a "Digital Identity Map" within Citiverse, identifying areas of low digital ID adoption and fragmented service access, aiming to guide targeted identity solutions, implemented through initial data integration and community surveys to pinpoint critical needs.

Medium Term (2026-2027): By 2027, the Citiverse "Digital Identity Map" will evolve into an interactive platform offering direct access to secure digital wallets, identity verification services, and data control tools, aiming to equip 50% of identified identity-marginalized residents with essential digital autonomy, achieved by fostering partnerships with government agencies and financial institutions.

Long Term (2030): By 2030, Rotterdam's Citiverse will offer as a comprehensive digital sovereignty hub, ensuring equitable access to trusted identity systems and self-managed data controls for all residents, realized through continuous monitoring, dynamic identity services, and citizen-led privacy protection initiatives.



7. Safety and Crime

Ambition: Use Citiverse as a platform for addressing safety, security and crime issues, especially deepfakes, to help residents identify and report digital threats while improving urban security.

Short Term (2025): By the end of 2025, Rotterdam will pilot a "Digital Safety Map" within Citiverse, identifying areas of high digital crime risk and common fraud patterns, aiming to guide targeted security measures, implemented through AI threat detection and community reporting to pinpoint emerging risks.

Medium Term (2026-2027): By 2027, the Citiverse "Digital Safety Map" will evolve into an interactive platform offering real-time deepfake detection, verified content alerts, and digital self-defence training, aiming to protect 50% of vulnerable residents from digital crimes, achieved by fostering partnerships with cybersecurity firms and law enforcement agencies.

Long Term (2030): By 2030, Rotterdam's Citiverse will function as a comprehensive digital security hub, ensuring advanced protection against synthetic media threats and cybercrime for all residents, report physical and digital threats while improving urban safety and security. And making our citizens more digitally resilient.



8. Social Entrepreneurship

Ambition: Leverage Citiverse to connect socially responsible enterprises (SREs) with local communities and NGOs to co-create solutions for pressing social challenges such as poverty, educational disparities, and environmental sustainability.

Short Term (2025): By the end of 2025, Rotterdam will launch a "Community-Enterprise Matchmaking" module within Citiverse, connecting socially responsible enterprises with local NGOs and community groups for initial project identification and resource sharing, implemented through a dedicated online portal for posting challenges and solutions.

Medium Term (2026-2027): By 2027, the Citiverse will facilitate collaborative solution co-creation for pressing social challenges like poverty and environmental sustainability, aiming to launch at least 15 co-developed projects addressing specific community needs, achieved by integrating virtual co-design tools and establishing a transparent project tracking system.

Long Term (2030): By 2030, Rotterdam's Citiverse will serve as a vibrant, self-sustaining ecosystem for continuous enterprise-community collaboration, enabling widespread, impactful social innovation across the city, realized through advanced AI-driven matching, standardized impact measurement, and dedicated funding facilitation.



9. Preventive Healthcare

Ambition: Develop a comprehensive preventative care and early intervention hub by integrating Citiverse's digital capabilities across all age groups. The unified system will utilize AI-driven analytics, wearable device integration, and telemedicine services to provide personalized chronic disease management for adult populations, and specialized remote monitoring with tailored interventions for elderly patients - establishing a seamless, data-driven continuum of care throughout the aging process.

Short Term (2025): Rotterdam will launch the integrated "Health Guardian" platform featuring both a Virtual Twin Starter for chronic disease prevention (serving 5,000 citizens through wearable/EMR integration) and a Senior Wellness Gateway for basic elderly monitoring (1,000 older adults), supported by shared infrastructure including secure data integration, a unified telemedicine portal, and common AI analytics.

Medium Term (2026-2027): The platform will evolve into cross-generational prevention services with adaptive care pathways that automatically adjust from general prevention to elderly-specific monitoring, supported by unified intervention tools including combined health coaching and shared telemedicine infrastructure with geriatric specialization.

Long Term (2030): Rotterdam will have a fully mature Smart Health Ecosystem enabling continuous life-course monitoring with dynamic care adaptation as citizens age, featuring a unified provider interface and achieving city-wide adoption through single sign-on access, integrated data governance, and shared research databases.



10. Citizen-Centred Government Services

Ambition: Develop a citizen-centric design ethos in all government services delivery, to ensure co-creation, flexibility, and trustworthiness between the city government and citizens with a particular emphasis on the inclusive and equal Citiverse concept.

Short Term (2025): By the end of 2025, Rotterdam will pilot a citizen-centric "Service Co-Design Module" within the Citiverse for one key government service, aiming to gather direct user feedback and initial design input, implemented through targeted outreach and virtual workshops for active citizen participation.

Medium Term (2026-2027): By 2027, the Citiverse will expand to enable co-creation for at least five critical government services, aiming to significantly increase citizen satisfaction and trust, achieved by integrating flexible design tools and transparent feedback loops within the platform.

Long Term (2030): By 2030, Rotterdam's Citiverse will be the primary platform for continuous citizen-led co-design and co-development across all government services, fostering a truly responsive and trustworthy public administration, realized through systemic integration, advanced collaborative features, and widespread citizen adoption.



11. Citizen-Centred Public Spaces

Ambition: We advocate for fostering a citizen-centric design ethos for all public spaces, encompassing both physical and emerging digital realms. This approach builds trust through co-creation and flexible design. The Citiverse will offer in the heart of the digital ecosystem a digital space that is open to everyone and in which public values are maintained. It enables continuous feedback and collaborative decision-making, ensuring that these spaces truly meet community needs. Prioritizing inclusive design is paramount to guarantee equitable access, engagement, and enjoyment for all residents in both physical and presently non-existent digital public spaces.

Short Term (2025): By the end of 2025, Rotterdam will launch a pilot "Public Space Co-Design" module within the Citiverse. This initial phase will focus on a specific physical neighbourhood, aiming to gather diverse citizen input on design elements and foster initial community engagement. Simultaneously, we will begin exploring and conceptualizing the requirements for future digital public spaces within the Citiverse, conducting initial user needs assessments and design principles for these virtual environments. This will be implemented through virtual design workshops and a user-friendly feedback interface for both physical and nascent digital concepts.

Medium Term (2026-2027): By 2027, the Citiverse public space initiative will expand to cover five key urban areas, addressing both physical interventions and the development of foundational digital public spaces. The aim is to significantly increase citizen satisfaction with newly developed or revamped spaces (both physical and digital) and build trust in urban planning. This will be achieved by integrating immersive design visualization and real-time collaborative decision-making tools for physical spaces, while launching initial, interactive digital public environments in the Citiverse for community gathering and interaction.

Long Term (2030): By 2030, Rotterdam's Citiverse will offer a platform for continuous, inclusive citizen-led co-design and management of all public spaces – both physical and fully realized digital environments. This will enable dynamic adaptation to community needs, fostering a vibrant, shared urban experience that seamlessly blends physical presence with digital interaction. This vision will be realised through ongoing innovation, widespread citizen adoption, and direct integration with urban planning processes, establishing Rotterdam as a leader in creating responsive public realms for the future.



12. Sustainable Spatial Development

Ambition: We propose utilizing the Citiverse as a powerful platform for addressing sustainable spatial development, centrally supporting Rotterdam's transition to climate-adaptive urban planning and equitable resource distribution. The Citiverse will enable dynamic citizen participation and co-creation throughout this process.

Short Term (2025): By the end of 2025, Rotterdam will pilot a "Spatial Sustainability Map" within the Citiverse. This module will identify areas of environmental risk and development opportunities across the city. Its aim is to guide targeted urban interventions. This will be implemented through intuitive 3D city modelling and active community input channels within the Citiverse, allowing citizens to highlight priority zones and directly contribute to early planning stages.

Medium Term (2026-2027): By 2027, the Citiverse "Spatial Sustainability Map" will evolve into an interactive platform. It will offer real-time environmental data, facilitate access to circular material banks, and provide advanced participatory planning tools for citizens and stakeholders. The goal is to integrate sustainability principles into 50% of all urban projects. This will be achieved by fostering robust partnerships with green builders and research institutions, alongside enhanced co-creation mechanisms within the Citiverse, empowering citizens to shape sustainable development outcomes.

Long Term (2030): By 2030, Rotterdam's Citiverse will function as a comprehensive spatial development hub, ensuring carbon-neutral urban growth and climate-resilient neighbourhoods for all residents. This will be realized through sophisticated digital twin simulations, dynamic zoning adjustments based on real-time data and citizen feedback, and widespread, community-led regeneration initiatives. The Citiverse will serve as the central point for continuous participation, enabling citizens to actively engage in, and directly influence, the sustainable evolution of their city.

