# **POLICY BRIEF**

Implementing Local Digital Twins: A How-To Guide

June 2025



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# INTRODUCTION



The smart city ecosystem is rapidly evolving, driven by technological advancements and the increasing need for sustainable urban development. At the heart of this transformation lies the concept of Local Digital Twins (LDTs), which offers a powerful tool for cities to enhance their digital capabilities and improve decision-making processes. LDTs are virtual replicas of physical assets, systems, and processes within a city, enabling real-time monitoring, simulation, and optimisation. By leveraging LDTs, cities can achieve greater efficiency, resilience, and citizen engagement, ultimately fostering a smarter and more sustainable urban environment.

This policy brief is targeted at city officials, urban planners, and digital transformation leaders in cities that are already advanced in their digital journey. In other words, cities possessing at least a Local Digital Platform (LDP), a centralised platform for collecting data from various systems, applications, Internet of Things (IoT) devices and other data sources. The target audience includes municipalities that are medium to advanced in terms of digital transformation and are seeking to navigate the complex smart cities ecosystem. This brief aims to provide clear and actionable steps to implement an LDT, offering guidance on how to get started and integrate LDTs into existing digital infrastructures.

Drafted in collaboration with experts involved in some of the European Commission's smart city initiatives, this policy brief is based on comprehensive desk research and interviews with city representatives. It aims to provide some insights and experiences of those at the forefront of smart city development, ensuring that the recommendations are both relevant and actionable. Ideally, this brief will serve as a valuable resource for cities striving to become smarter and more connected in the digital age.

# LOCAL DIGITAL TWINS: WHAT THEY ARE AND WHY THEY MATTER

LDTs are virtual representations of a city's physical assets, systems, and processes. These digital replicas enable cities to model, simulate, and improve urban systems, serving as the operational layer of a smart city. While the broader concept of a smart city encompasses various technologies and strategies aimed at enhancing urban living, LDTs specifically focus on the integration and optimisation of city operations through real-time data and advanced analytics.

In advanced smart cities, the role of LDTs is pivotal in transitioning from siloed data collection to integrated decision-making tools. Traditional smart city initiatives often involve disparate data sources and isolated systems, which can hinder comprehensive urban management. LDTs address this challenge by providing a unified platform where data from various departments and sources can be aggregated, analysed, and leveraged for holistic urban planning and operations.

The key benefits of implementing LDTs are manifold:

- Data-driven urban planning and operations: LDTs enable cities to make informed decisions based on accurate and up-to-date data, improving efficiency and effectiveness in urban management.
- Scenario testing: Cities can simulate various scenarios, such as traffic flow, energy consumption, and flooding, to predict outcomes and optimise responses.
- **Cross-departmental collaboration:** LDTs facilitate data sharing and collaboration across different city departments, helping to bridge the gap between varying levels of digital maturity and fostering a more cohesive approach to urban management.
- Enhanced citizen engagement: By interacting with the digital twin, citizens can provide feedback on proposed scenarios and gain a better understanding of urban environments through interactive representations. This fosters greater transparency and participation in city planning processes.

LDTs received particular attention under the Digital Europe Programme, reflecting their significance in the EU's digital transformation agenda. The Living-in.EU community supports the development and implementation of LDTs, and the forthcoming EU Local Digital Twin Toolbox will provide further resources and guidance for cities embarking on this journey. Through these initiatives, the EU aims to empower cities to leverage LDTs for smarter, more sustainable urban development.

# **GETTING STARTED: PRE-CONDITIONS AND QUICK ASSESSMENT**

Implementing an LDT requires certain pre-conditions to ensure a successful deployment. The following conditions are essential:

- A digital transformation strategy in place: Cities must have a clear and comprehensive digital strategy that outlines the objectives, processes, and technologies required for digital transformation.
- **Reliable, accessible urban data:** The availability of high-quality, harmonised data is crucial. Adopting open-source platforms and standardised APIs can ensure data quality and interoperability.
- Data governance and interoperability measures: Implementing measures such as Minimum Interoperability Mechanisms (MIMs+) is vital for seamless data integration and sharing across different systems and departments.
- An integrated Local Digital Platform (LDP): A centralised platform for collecting data from various systems, applications, IoT devices, and other data sources is a key foundation for LDT implementation. This platform enables the aggregation, analysis, and utilisation of data, providing a unified foundation for the digital twin.
- **Political and administrative buy-in:** Strong support from local political leaders and administrative bodies is necessary to drive the digitalisation process.

To self-assess readiness for LDT deployment, cities can leverage the <u>LORDIMAS</u> tool available on the Living-in.EU platform. This tool helps cities evaluate their current digital maturity and identify areas for improvement. Additionally, consulting the EU <u>Online</u> <u>Procurement Helpdesk for Smart Communities</u> can provide validation of the starting point and offer tailored advice and support.

By adhering to these pre-conditions and leveraging tools like LORDIMAS and the Online Helpdesk, cities can effectively assess their readiness and take the necessary steps to implement LDTs, ultimately enhancing urban management and citizen engagement.

# **KEY PRACTICAL STEPS TO IMPLEMENTING A LOCAL DIGITAL TWIN**

Implementing an LDT involves a series of strategic and practical steps that can help cities leverage digital technology to enhance urban management and citizen engagement. Each step is crucial for building a robust and adaptable LDT that addresses real-world challenges, ensures data reliability, selects appropriate tools, and creates actionable visualisations. Continuous monitoring and improvement further ensure the LDT's ongoing value and effectiveness.

#### Define a strategic use case

The first step in implementing an LDT is to identify a specific urban challenge that the digital twin will address. This ensures that the project has a clear focus and delivers measurable benefits.

In concrete terms:

- Focus on a real, high-impact urban issue: Identify a pressing urban challenge that can benefit significantly from the implementation of an LDT, such as traffic bottlenecks, energy waste, or heatwaves.
- Engage key departments and external stakeholders early on: Involve relevant city departments and external partners from the outset to ensure comprehensive planning and buy-in.
- Get inspired by cities in the Living-in.EU community: Look to other cities within the Living-in.EU community for examples and inspiration on effective use cases and implementation strategies.

# Organise and standardise your data

Effective data management is the foundation of a reliable LDT. Organising and standardising data ensures comprehensive coverage and seamless integration across different systems.

In concrete terms:

- **Map existing datasets and identify gaps:** Conduct a thorough inventory of available data and pinpoint any missing information that is crucial for the LDT.
- Prioritise data interoperability using the MIMs+ framework where relevant: Ensure that data from various sources can be integrated seamlessly for instance by adhering to the Minimum Interoperability Mechanisms (MIMs+) framework.
- Start with open standards and open data where possible: Utilise open standards and open data to facilitate easier integration and collaboration.

### Select tools and build with reusability in mind

Choosing the right tools and building with reusability in mind ensures that the LDT can adapt to evolving needs and integrate with other systems. This step is crucial for creating a flexible and scalable platform.

In concrete terms:

- Consider modular platforms and cloud options: Choose flexible and scalable platforms that can adapt to evolving needs and integrate with cloud services for enhanced accessibility and performance.
- Use open-source or EU-funded tools: Leverage open-source tools or those funded by EU initiatives, which will be available via the EU Local Digital Twin Toolbox.
- Explore reference architectures from the Living-in.EU Technical working group: Consult reference architectures provided by the Living-in.EU Technical working group to guide the development process.

# **Create and visualise the Local Digital Twin**

Creating and visualising the LDT makes data accessible and actionable for decision-makers. This step involves integrating various types of data into a user-friendly interface.

In concrete terms:

- **Combine geospatial, sensor, and statistical data in a user-friendly interface:** Integrate various types of data to create a comprehensive and intuitive digital twin.
- Start simple dashboards, 3D city models, or simulation layers: Begin with straightforward visualisations such as dashboards, 3D models, or simulation layers to make the data accessible and actionable.

• Ensure usability for non-technical staff and policymakers: Design the interface to be user-friendly for non-technical staff and policymakers, ensuring broad accessibility and utility.

## Monitor, improve, and scale

Continuous monitoring and improvement ensure the LDT's ongoing value and effectiveness. This step involves tracking performance, sharing results, and planning for future expansion.

In concrete terms:

- **Define indicators to track the LDT's value:** Establish key performance indicators (KPIs) to measure the impact and value of the LDT, such as cost savings and service quality improvements.
- Share results within and beyond your city: Disseminate findings and best practices both internally and with other cities, using platforms like the Online Helpdesk to publish and benchmark results.
- **Plan for expansion:** Develop a roadmap for scaling the LDT, incorporating more data sources, additional use cases, and greater citizen engagement over time.

# **OVERCOMING KEY CHALLENGES**

Implementing an LDT can significantly enhance urban management and citizen engagement, but it also comes with its own set of challenges. Addressing these challenges is crucial for the successful deployment and operation of an LDT. This section outlines common obstacles and provides practical solutions to overcome them.

#### Siloed departments

One of the primary challenges in implementing an LDT is the existence of siloed departments within city administrations. Different departments often operate independently, leading to fragmented data and decision-making processes. To overcome this, the LDT should be used as a shared project that involves planning, mobility, IT, and other relevant departments. By fostering collaboration and data sharing, the LDT can serve as a unified platform for integrated urban management.

# Lack of technical capacity

Cities may face a lack of technical expertise required to implement and manage an LDT. Starting with a small pilot project can help build technical capacity gradually. Additionally, cities can access support via the Online Helpdesk or partner with EU-funded networks to gain technical assistance and resources. Leveraging external expertise can bridge the gap and ensure successful implementation.

# **Limited budget**

Budget constraints are a common challenge for many cities. To address this, cities can reuse open-source tools and platforms whenever possible, reducing costs associated with proprietary solutions. Applying for funding through programmes like the Digital Europe Programme can provide financial support. Teaming up with other cities to share resources and costs is another effective strategy to overcome budget limitations.

### Low citizen engagement

Engaging citizens in urban planning and decision-making processes is essential for the success of an LDT. Low citizen engagement can be addressed by using LDTs to visualise the impact of urban projects and opening up participatory planning processes. The forthcoming EU Local Digital Twin Toolbox will include citizen engagement templates, providing cities with tools to involve citizens effectively and transparently.

# Data quality/integration issues

Ensuring data quality and seamless integration is critical for the functionality of an LDT. Applying the Minimum Interoperability Mechanisms (MIMs+) framework for instance can help achieve consistency and interoperability across different data sources. Cities can use examples from other successful implementations to guide their efforts. In addition, the existing <u>Interoperability Test Bed (ITB)</u> platform will soon offer cities the capability to assess system compliance with MIM+ standards, anticipated to be available around 2026, contingent on the future test owner's timeline.

By following the key steps outlined in the previous section and by addressing the challenges presented in this one, cities can move towards successfully implementing LDTs, driving innovation and improving urban management through collaborative efforts and data-driven insights.



# THE STORY OF NOVO MESTO:

A JOURNEY TOWARDS LDT IMPLEMENTATION

#### CONTEXT

Novo mesto embarked on their digital twin journey to address the fragmentation caused by multiple systems and platforms with vendor lock-in. The lack of interoperability and different standards required the creation of a common platform. The Slovenian city's digital strategy, which focuses on platform and systems efficiency, played a crucial role in guiding the development of the platform. By prioritising efficiency and reducing complexity, the strategy helped streamline administrative processes and integrate various data sources. The city's tech-savvy mayor has been instrumental in driving the digitalisation process, pushing for less bureaucracy and greater efficiency. Novo mesto now has a stable platform with data collected from various sensors, primarily from public facilities, and is seeking funding to expand their data sets and analytical capabilities.

#### **CHALLENGES ENCOUNTERED**

Novo mesto faced several challenges in their journey towards implementing an LDT. Initially, they relied on various solution providers who were reluctant to share data freely, leading to issues with data quality and integration. Some of the vendors aimed to sell public data back to the city, creating a dependency and hindering progress. The city had to overcome vendor lock-in and noninteroperable systems by adopting an open-source IoT platform called <u>ThingsBoard</u> part of <u>The</u> <u>Things Network</u> initiative and standardised APIs from <u>FIWARE</u>. Political leadership changes at the national level combined with the <u>Ministry</u> for Digital Transformation's lack of legal basis to support local digital development also posed challenges since Novo mesto had to rely on its own resources and initiatives. Additionally, defining and prioritising datasets proved highly technical and time-consuming, requiring collaboration with data owners to identify the most critical information.

#### **LESSONS LEARNED**

Novo mesto's experience offers valuable lessons for other cities. Emphasising open-source platforms and making "open source" a requirement in public procurement documents helped prevent vendor lock-in and facilitated seamless data integration. Starting with visible, impactful projects and securing funding quickly generated support both internally and externally. Collaboration with other cities, both within Slovenia and across borders with Croatian cities, proved beneficial for sharing best practices and applying for common funding. Continuous monitoring and improvement were essential, with key performance indicators (KPIs) focusing on data quality and reliability.

#### **NEXT STEPS**

While Novo mesto already has an **effective LDP**, it has laid strong foundations for the deployment of an LDT. The city's next step is to **develop analytics** and **contextualisation layers** for its platform, which will enable more advanced analysis and simulation, such as mobility scenarios and historical event tracking. By continuing to **build on** its **existing infrastructure** and addressing key challenges, Novo mesto is **well-positioned** to fully realise the benefits of a LDT, driving **innovation** and **improving urban management**.

# **KEY RECOMMENDATIONS TO GET STARTED ON YOUR JOURNEY**

Building on the insights from Novo mesto's journey and the practical steps to implementing an LDT, the following recommendations provide a roadmap for cities looking to embark on their own digital transformation. These key recommendations address common challenges and leverage best practices to ensure a successful deployment of LDTs.

#### 1. Start with a clear purpose

Focus on one real-world challenge—mobility, energy efficiency, flood risk—and build your LDT around it. A targeted use case helps focus resources, data, and stakeholder buy-in.

#### 2. Don't build from scratch

Save time and money by reusing what already exists. The EU Local Digital Twin Toolbox will offer templates, open-source tools, and example architectures. Peer examples from the Living-in.EU community can help you avoid common mistakes.

#### 3. Make your data work for you

Even with limited data, you can start. Map your existing datasets, identify gaps, and apply the MIMs+ interoperability principles to ensure your twin is future-proof and scalable.

#### 4. Break silos, build bridges

Bring together departments—IT, planning, transport, sustainability—and build ownership from day one. LDTs thrive when they serve multiple city functions, not just tech teams.

#### 5. Engage citizens early

Use the LDT to visualise the future, run simulations, and involve people in shaping solutions. This builds trust and helps align your twin with public expectations.

#### 6. Take advantage of EU support

Reach out to the EU Online Helpdesk for tailored advice, mentoring, and technical support. Join the Living-in.EU community to collaborate with other cities and explore funding opportunities.











# If you'd like to know more about Novo mesto's experience with implementing an LDT, you may contact:

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# Additional resources:

- Online Procurement Helpdesk for Smart Communities | Living in EU (living-in.eu)
- LORDIMAS | Living in EU

Do you have a solution in mind that you would like to propose for a peer-leaning policy brief?

PLEASE CONTACT US WITH A SHORT DESCRIPTION OF YOUR SOLUTION TO SET UP AN EXPLORATORY MEETING



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