EUROCITIES

Eurocities Task Force on Digital Twins

“Engaging twins”

October 2022

Abstract

The “Engaging twins” report presents the work of the Eurocities taskforce on digital twins. Kicked off in December 2021, the Taskforce has provided cities with a space to share experiences, needs and challenges on digital twins. Three thematic workshops have given cities and experts the opportunity to exchange around the roles and skills needed to support digital twins, the models and semantics of the digital twins’ infrastructure and the strategies for trustful and participatory digital twins. As a result, the taskforce has demonstrated that digital twins are not merely digital representations of physical spaces and processes, but they hold a great potential for smart and resilient cities. The report presents the objectives of the taskforce, linking it with the EU strategy for the twin digital and green transition, outlining the knowledge, experiences and resources shared by experts and cities during the three sessions. Establishing an important framework for future collaboration among cities.

#DIGICities
#DigitalTwins

eurocities.eu

The road to the Digital Twins Task Force

Digital technologies are revolutionizing the interaction between cities and the digital world, transforming the digital representation of physical realities, processes and systems. This is the case for digital twins. Already used to analyse and visualise complex information for industries, it is only in recent years, that digital twins have been adopted in a multitude of other sectors, such as energy, mobility and urban planning.

The "Foresight & Digital Twins, going beyond the bricks" event, during the Digital Forum Annual Forum meeting in 2021, highlighted the advantages of digital twins technologies for cities. Digital twins are not merely a digital representation of physical processes, systems, persons, and environments. Placed into urban contexts, digital twins help smart cities to reassess their urban planning, transforming how cities are displayed, monitored and managed. Data integration, interoperable data platforms and multi-dimensional visualisation, allow cities to interact with innovative technologies, profiting from the power of the Internet of Things and Artificial Intelligence. City departments and policymakers can assess real-time data and up-to-date visualisations. Multi-dimensional visualisations allow to simulate urban planning interventions, estimating the impact of various scenarios, from the creation of pedestrian areas, to the impact of a new metro line on air pollution, to the influence of touristic flows on the city infrastructure.

Digital twins, however, are complex solutions of a broad infrastructure. A connected ecosystem of multiple sectors that interact among them and require interoperability components, open standards, accessible data platforms and data governance. To build such infrastructure, collaboration is crucial. Knowledge and skills should be shared, data systems require interoperable standards, and the ecosystem need to be trustworthy and participatory.

The recording of the "Foresight & Digital Twins, going beyond the bricks" session is available here: https://bit.ly/3BHG2lD

The PPT presentation by Gianluca Misuraca and Pierre Rossell is available here: https://bit.ly/3UBFqGK

Digital Twins and the Twinning transition

The digital transformation is taking place against a backdrop of rapid climate change that is screaming for mitigating action. The EU's policy agenda looks at digital twins as far-reaching technologies that can support smart cities in contributing to the European green deal strategy, enhancing energy efficiency, adaptation of society to climate change and resilience of urban centres.

The Strategic Foresight Report 2022, "Twinning the green and digital transition in the new geopolitical context" identifies digital twins, together with technologies such as AI, blockchain, IoT and quantum computing, as having a key role in facilitating innovation and supporting the interaction between the green and digital transition. It defines digital twins as "a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making". In response to the urbanisation challenge, digital twins can enhance planning, monitoring and management of urban spaces, increasing resource efficiency of buildings and promoting more resilient smart cities.

It is for this reason that the Digital Europe Program 2021-2022 indicates digital twins as part of its strategy for the digital transformation of smart communities. To accelerate the twin digital and green transition, one of the objectives of the program is to support the creation of a European Local Digital Twin (LDT) toolbox for the deployment of AI-powered local digital twins across the EU. The toolkit should be based on open standards, re-usable tools, reference architecture and technical specifications, as well as tools for citizens engagement. It should help mapping EU-based technology providers active in the deployment of local digital twins and propose a plan to scale-up local digital twins across the EU.

As also recognized by the Digital Europe Program, not all EU cities and communities are at the same level in their digital transformation. There are some which have already profited from digital technologies, others that have started investing in their digital transformation, and a few others that are still at an early stage. Recognizing the different levels of maturity of cities and local communities is crucial for the twin green and digital transition. Regulation, policy and funding are part of a solution in which knowledge exchange and capacity building among peers plays an equally important role. Hence, the relevance of networks such as Eurocities, the Living-in.EU movement and other specific initiatives to share knowledge and experience, to identify challenges and mapping opportunities for collaboration.

THE EUROCITIES TASKFORCE ON DIGITAL TWINS

In line with the objectives of the EU digital agenda, the Eurocities taskforce on digital twins aims at promoting a culture of "digital twinners", in which smart cities can share experiences, knowledge, initiatives, best practices and harmonise strategies.

The kick-off event in December 2021, offered the opportunity for members to express their interest in collaborating on the topic of digital twins. It has permitted to define common challenges and cities' needs, defining the objective of the taskforce, as well its outcomes and deliverable actions.

Participating cities identified three main challenges to the adoption and implementation of digital twins:

Creating synergies and connecting with citizens

Digital twins are complex urban assets using data to engage with citizens, but also with city departments and third parties. There is a challenge to make digital twins an appealing and user-friendly tool for those responsible for providing and developing services and at the same time foster participation/support among citizens, so to avoid broader disparities and increasing the digital divide.

When adopting digital twins, cities need a clear explanation of the use and added value of digital twins (data) in day-

to-day surroundings and public space, and the effects of AI tools such as machine learning within digital twins to achieve openness, trust, support and participation. Finally, digital twins need to be promoted through a holistic approach, being connected to other digital developments as well as other digital twins.

Use of data and technical issues

In order to function properly, digital twins need to be supported by data interoperability, and transfer of data between diverse urban digital twins and underlying platforms. It requires cities to arrange the procurement of development, exploitation and governance of Open Urban Platforms. There is the challenge of obtaining data and arranging access to quality data from the different actors that could be effectively used in a Digital Twins and generate beneficial 3D models.

Governance and management Issues

The government's role in the development of the digital twins' infrastructure represents another significant challenge for cities. Digital twins' infrastructures need to be modelled and supported by a supercomputer and/or other resources, which need to be supported by financial resources and fundings. To do that, the exact value proposition of a digital twin should be defined, as well as its social/public use, so to justify the development and use of Digital Twins.

Moreover, to develop wider synergies and to foster citizenship participation in the development of Digital Twins, clear management and understanding, from both the political and the technological teams is needed, for a clear understanding of what to expect-and when to expect it.

Based on the main challenges and needs identified by cities, the taskforce on digital twins intervenes on two layers: horizontal and vertical layers.

On the Horizontal level, the taskforce develops a community of members able to:

- Share knowledge: improving reusable problem-solving experiences, better and faster decision making, reduce loss of know-how and stimulate the growth of DT projects.
- Create a 'digital twinners family': an established culture where members can turn to when in doubt and to grow harmonised strategies, thus encouraging new members to join.
- Take stock of different initiatives based on a common definition of local digital twins, with the objective of creating an open repository of digital twins' initiatives and programs.

On the vertical level, the taskforce contributes by:

- Promoting a position of cities on the governance of digital twins.
- Endorsing Digital twins as essential tools for building a resilient, democratic and fair digital ecosystem, both at local and European level.
- Coordinating the efforts of all those who wish to raise digital twins at the European political level in order to secure funding and to promote future calls for proposals.

According to the challenges and needs identified by cities, the taskforce on digital twins has proposed a series of thematic webinars held at one-month intervals and with the participation of cities and experts on digital twins. The three thematic webinars offer an opportunity to exchange know-how and experience on Digital Twin projects and initiatives, promoting future collaborations to create a community platform for digital twins.

The first session discussed the roles, capabilities and skills that digital twins infrastructures need to have in place to make the most of digital twins. The second session focused on data models and semantics, which are critical to sustain interoperability of data and to collect and share information. The third and last session focused on data visualisation and trust, essential for accessible, inclusive and trustworthy digital twins.

Session I: Roles and Skills

TOPIC OF THE SESSION

Which departments are involved in developing and using Digital Twins? What roles, capabilities and task descriptions are part of a successful Digital Twin organization? And what skills are needed on the local level to make the most of Digital Twins, now and seven years from now?

The objective of the session has been to come to a common understanding of the roles and skills needed to leverage digital twins on the local level now and in the future, and to identify possible skills gaps and common challenges among cities.

The recording and wrap-up of the session "Roles and Skills" are available here: https://bit.ly/3fmxqcE

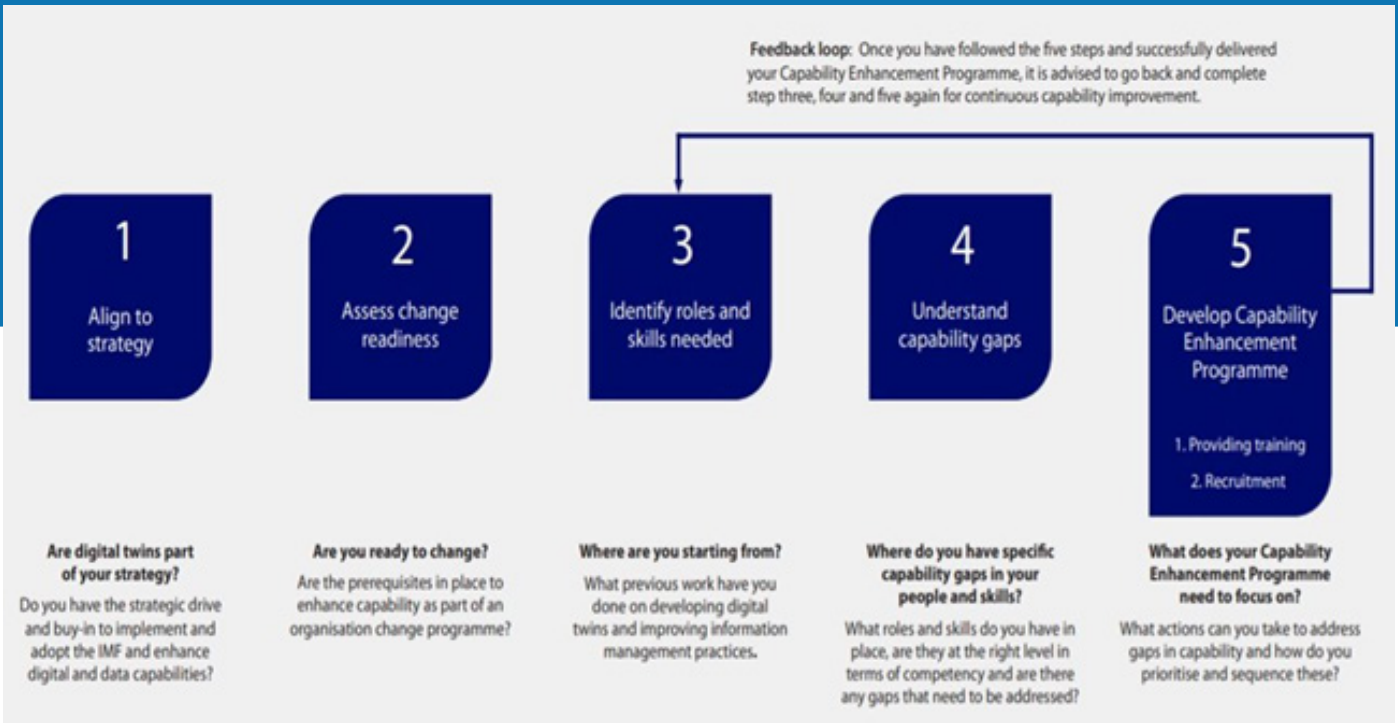
THE PERSPECTIVE OF THE EXPERT

Pierre El Hajj, from the UK National Twin programme was the expert invited to the first webinar session. He presented the national vision of digital twins for the built environment, the digital twins' design and skills' infrastructure of the Centre for the Digital Built Britain (CDBB).

The UK National Twin Programme identifies digital twins within a "system of systems", a complex and interconnected system in which multiple sectors interact (e.g., transport, energy, water, telecoms, social infrastructure, interface with the natural environment). For this reason, digital twins should not be seen as a massive digital model but as a connected ecosystem of multiple sectors that interact in the built environment.

To do that, actors interacting with digital twins need to rethink their infrastructure. The purpose of digital twins remains the same, making better decisions in a faster way. However, the infrastructure around digital twins needs to be shifted from a siloed to a system thinking: an information Management Framework (IMF) in which information management across sectors is improved and digital twins are connected.

The Information Management Framework (IMF) produced by the UK National Digital Programme is built upon two core pillars: Business and Digital Skills. The business side is centred around: communication, collaboration, transformation and leadership, adaptability, commercial mindset and business analysis. It



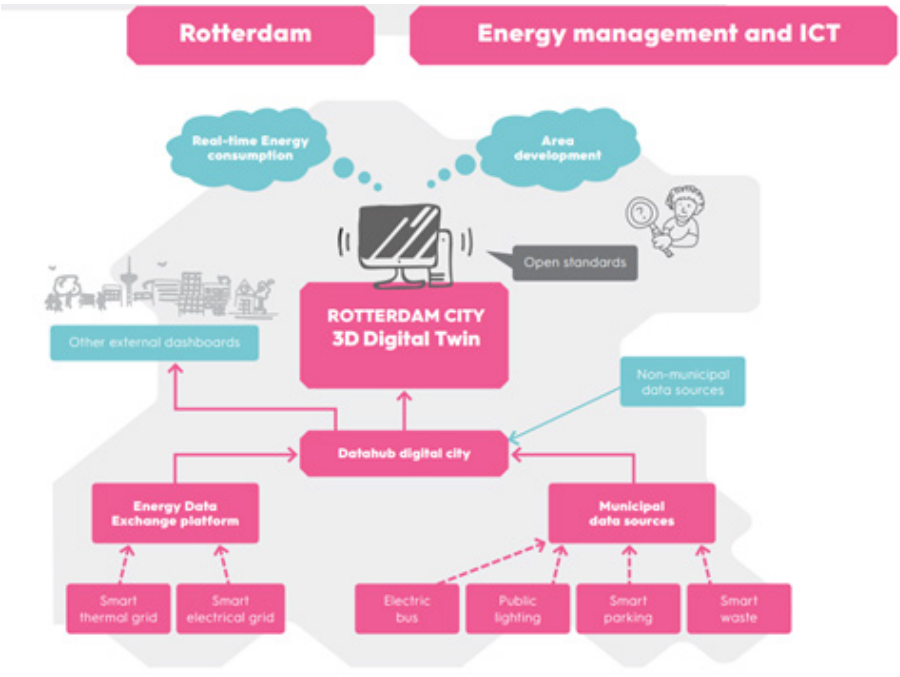
requires roles such as process modeller, data regulator, sector regulator and benefits manager. The digital skills foundation, instead, is composed of data fundamentals, lifecycle assurance & quality management, data modelling, analytics & intelligence, experience & application, security & ethics. This pillar instead, particularly requires roles such as: Digital data custodian, data architect and cybersecurity specialist.

Identifying the most adequate skills and competencies, however, often requires a resource plan and an organizational change. For this reason, the IMF suggests five steps for a continuous capability improvement: (1) align to strategy, (2) assess change readiness, (3) identify roles and skills needed, (4) understand capability gaps, (5) develop capability enhancement programme.

LESSONS FROM THE CITY: ROTTERDAM

The Roadmap Next Economy project of the city of Rotterdam defines an investment strategy for the socio-economic and climate transition of the city.

In this context, the Ruggedised project aims at transforming large districts or buildings into low carbon and resource efficient districts through smart interaction and integration of energy systems at district level. Ruggedised will implement 13 smart solutions to achieve maximum energy efficiency and CO2 reduction, while having a social economic impact in



CHALLENGES & KEY TAKEAWAYS

- The development of open and common data standards is crucial. Digital Twins connects multiple databases, which require common standards for sharing the data.
- Digital twins should not only be approached from a technical point of view, but also from a socio-technical aspect, such as skills and competences.
- The Digital Twin infrastructure should be built upon skills rather than roles. This would permit a more adequate skills' gap analysis.
- It is important to recognise that the change around digital twins is about information management maturity.
- The change around Digital Twins should be interpreted as a better information management across sectors and businesses. Digital twins are dependent on the interaction across multiple sectors, such as the energy or transport sectors.
- Digital Twins are the product of a joint collaboration effort: everyone is paying data, information and knowledge; everyone is gaining from the shared solutions based on digital twins.
- Key conditions for the development of effective and replicable digital twins are disconnection between data and storage from applications development, data and platform ownership and governance issues, avoiding vendor-lock in, co-creation with commercial parties for acquiring knowledge and resources.

terms of job creation, levels of participation of citizens and quality of life.

One of its smart solutions, aims at building a "3-D city operations platform". The platform discloses and visualises actual use of energy as well as its use over a period of time, by individual buildings as well as the whole area. Complemented with the data on the energy use of buildings, provided by the energy management system, the platform will be connected to the 3-D model of the city, which will form its 3D Digital Twin.

The 3D city operations platform will make possible to monitor and communicate different information, enabling endless applications and scalable solution to digital city level.

To do so, the city of Rotterdam require different types of roles, both at the municipal level and within the innovation team. Roles such as connectors, boosters and investors are required at the municipal level, while operator, market master, data supplier, developers supports the innovation team. The city, however, also need to involve a wider pool of experts, from sectors such as finance, communications, administrative sensitivity, privacy, legal and risk management.

LESSON FROM THE CITY – MUNICH

The city of Munich places Digital Twins at the heart of Munich's Smart City approach and its mission of becoming climate-neutral by 2035.

To support the digital twins infrastructure, the city has built a co-working solution: a core and a project team, which support the foundations of the digital twins infrastructure. The city also places a significant importance to building partnerships with universities and research centres, a crucial element for the continuous innovation of digital twins projects. An example of such partnership is given by the "Implementation Partnership MasterPortal", an open source portal for geo, real-time and statistics data, initiated from a cross-city partnership between the cities of Munich, Frankfurt, Remscheid, Hamburg and Schwerin.

Session 2: Data Models and Semantics

TOPIC OF THE SESSION

How can data collected by digital twin technologies be maintained and shared; what is the role of data models to organise this information, and how can cities ensure the interoperability of such data?

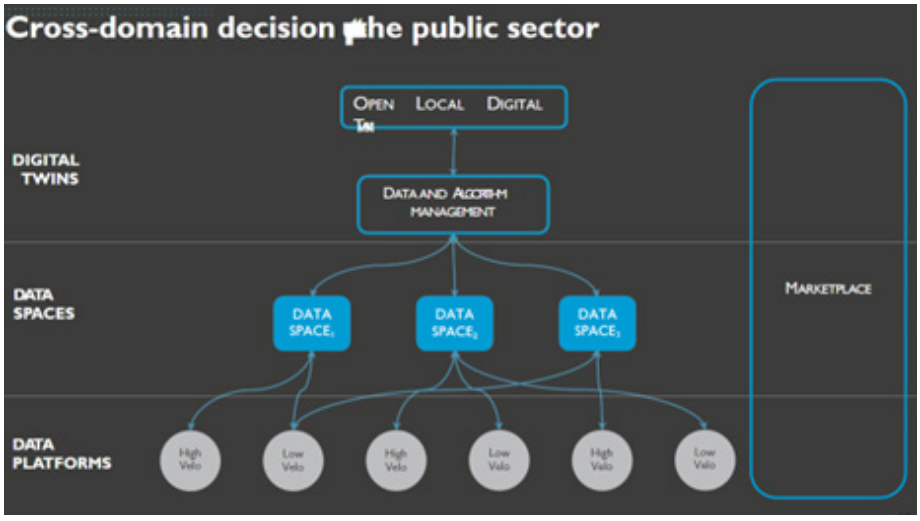
THE PERSPECTIVE OF THE EXPERT

Jorge Gil, associate professor in Urban analytics and Informatics at the Chalmers University of Technology and Tanguy Coenen, Programme Manager at Imec were the experts invited to the second webinar session.

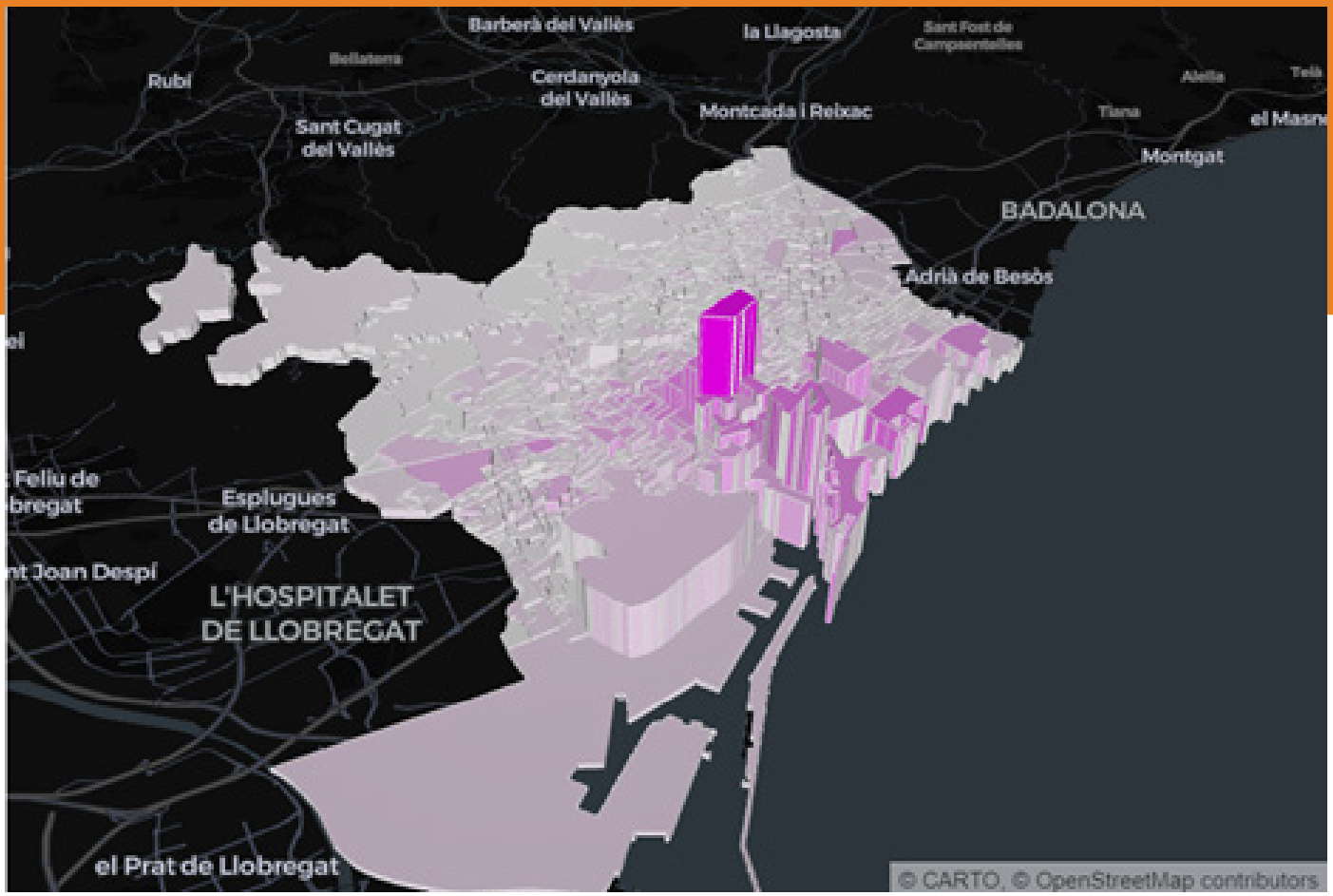
Digital twins are much more than a semantic 3D city model, they also require fundamental elements such as data accessibility, open standards and performance. Digital twins should be seen as having two main roles: an interactive platform to process and visualize information; and a mediator which links information into a complex system of data models.

The Recording and wrap-up from the session "Data Models and Semantics" are available here: https://bit.ly/3dHpoKK

According to this logic, the "Data Models for Digital Twins" designed by the Digital Twin City Centre project aims at creating a methodology for digital twins, which looks at the types of data existing, data accessibility and resources available. To do this, a solution suggested by the project is to ask users 20 questions to ask to a Digital Twins' use case. By doing so, it is possible to get a better understanding of the specific use case, its domain and the data requirements needed to build the data model.



The objective is to create models of digital twins that could be customised to different situations. Digital twins' models that should not be designed as centralized systems but instead as a complex and federated schema based on three key features: interoperability, trust and data value. Digital twins' infrastructures need to be built upon open standards and protocols, which allow data models to be linked across different domains and to data experts to exchange on data models.



LESSONS FROM THE CITY – BARCELONA

The city of Barcelona is betting on digital twins as the future of city planning. Counting on the MareNostrum supercomputer, the city is revolutionising its city planning. The creation of a digital twin of the city is permitting to test potential city planning projects and valuate its impact on the urban infrastructure.

An example is given by the "Superilles", the superblock project: the public space transformation model for the city of Barcelona. It promotes an innovative street model which reclaims spaces for citizens that were occupied by private vehicles. By designing "green axes" and squares in most central areas of the city, public spaces have been transformed into areas in which local people are at the central stage.

Digital Twins have supported not only the design of the project but have also revealed its impact on the urban infrastructure. An analysis of the Barcelona supercomputer centre has showed that, while improving air quality, superblocks have also increased pollution in adjacent areas where traffic has been displaced. In this way, digital twins' technologies have permitted to evaluate the impact of urban policies, correcting them while being implemented.

The city of Barcelona is also revolutionizing its urban planning through the 15-minutes city. Accelerated by the Covid-19 crisis, the climate emergency and the expanding challenge of gentrification, an increasing number of cities have started to rethink their urban spaces, so to bring more liveable, inclusive and resilient cities. The 15-minutes city concept denotes within 15 minutes the maximum time from home for residents to access the goods and services needed for their daily life.

To actualize its 15-minutes city, Barcelona has looked at digital twins. For instance, the "Inside AirBnB data" project, reproduces a digital twin of the city by visualising several features, such as AirBnB number and their distance from the city centre. Still under development, the project will soon permit to visualize other features such as schools, bus stops, the distribution of nationalities and of age groups across the different neighbourhoods of the city.

CHALLENGES & KEY TAKEAWAYS

- Digital twins are much more than 3D digital model. They also need data interoperability, accessibility and long-run maintenance.
- Organisations and cities need digital twins for different purposes, digital twins need to be built according to the specific needs of the city.
- Building customized digital twins' models for each use case is very time consuming. Adopting open data standards already developed by other organisations, can help to speed up the process.
- The 3D dimension for digital twins is not a necessary feature of digital twins Most importantly, digital twins need to align and link semantic data models and ontologies.
- Some of the main challenges related to data for digital twins are ownership across organisations, interoperability across sectors, quality of sources and sustainability over time.

Session 3: Data visualization and Trust

TOPIC OF THE SESSION

How can we make digital twins accessible and inclusive? In which way digital twins can be presented as trustworthy instruments to the users? How to build a collaborative environment between private and public actors?

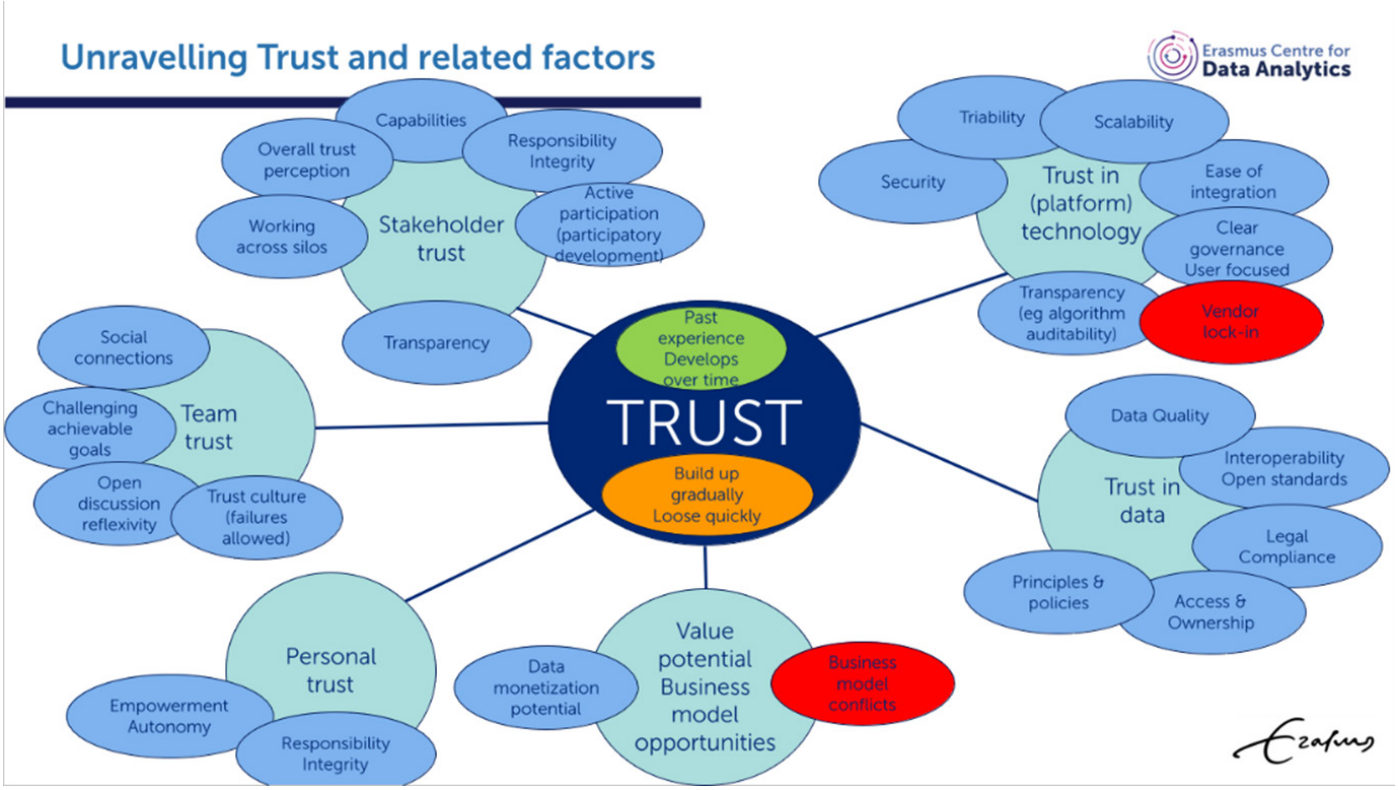
THE PERSPECTIVE OF THE EXPERT

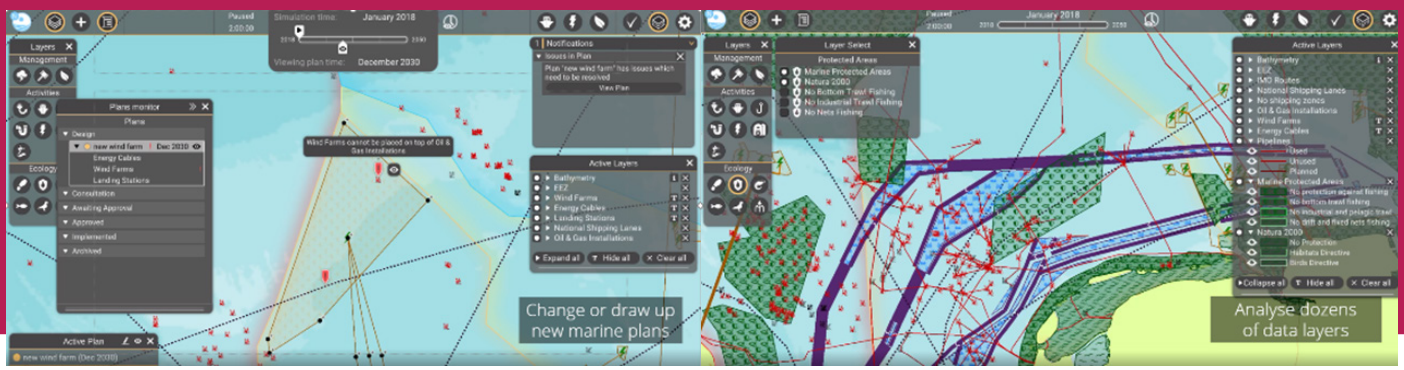
Marcel Van Oosterhout and Harald Warmelink were the experts invited to the third webinar session.

Open standards, transparency, interoperability and data driven solutions represent key aspects of the digital twins' infrastructure. Trust also constitutes another key aspect of digital twins' technologies.

Trust among the stakeholders, in the platform technology and in the data are all key elements that lead to platform adoption and platform use, and that

The recordings and wrap-up of the session "Data visualisation and trust" are available here: https://bit.ly/3BNB7zB





can finally bring to value creation. However, trust is often influenced by many external elements.

Trust among the stakeholders is often influenced by the relationship between private and public actors, the trust in their reciprocal capabilities, the level of involvement and responsibility. Trust in the technology is affected by transparency, security and scalability requirements of data platforms. Trust in the data is very much dependent on legal requirements and adherence to open standards.

According to a 2019 study by the Erasmus Centre for Data Analytics, conducted among 80 cities in Europe, trust among the partners is indeed one of the key accelerators of the urban data platform, followed by the "triple helix collaboration", the partnership between public, private and academia.

To confront the level of mistrust which notably characterise the relationship between the public and the private, the study has identified several factors that could increase their collaboration. To be trusted by the private, the public sector needs to improve the government's capabilities and expertise on most technical competencies. At the same time, to be trusted from the public, private companies need to improve their integrity and open to broader perspectives and integrate societal values into their business models. Finally, a fundamental element to build trust is collaboration. A collaborative environment is key to a trustful partnership.

AN INSIGHT FROM THE MARITIME SPATIAL PLANNING CHALLENGE

Supporting a collaborative and multi-users platform is also one of the main goals of the Maritime Spatial Planning (MSP) challenge. Based on free and open sources, the MSP permits to analyse dozens of data layers on maritime protected areas and shipping routes. The MSP challenge has multiple objectives: exploring potential consequences of human activities in maritime zones, making actual spatial planning, simulating, evaluating the effect of the different activities over time and collaborating with other users to explore collaboration with resembling projects.

The MSP offers the possibility to users to simulate different spatial initiatives, such as the creation of wind farms or energy cables, and to visualize the impact of such human activity in the area. For example, the creation of a wind farm in the North Sea could generate obstacles for shipping routes already in place or gas installations. Being a multi-player platform, the MSP challenge gives the possibility to share and collaborate with other users, opening different initiatives for consultation, collecting feedbacks and building partnerships.

Moreover, the MSP challenge also permits to visualize the consequences of the spatial plans over a longer period on time and on different layers, such as on the ecosystem and natural habitats. All these elements should be considered, not only for maritime contexts, but also for every urban digital twin planning. Indeed, as demonstrated by the challenge, every human activity and alteration of an environment, generates implications on the surrounding ecosystem. For this reason, to make digital twins accessible and trustful, it is important to allow for scenarios testing and engaging citizens through a collaborative environment.

CHALLENGES & KEY TAKEAWAYS

- Trust is a fundamental element to accelerate action and value creation of digital twins.
- A collaborative environment is a key element for a trustful relationship between the public and the private
- Transparency on data usage and autonomy of the data owner can enhance trust and usage of digital platforms
- To create a collaborative environment, it is important to allow for scenarios testing and a participatory process
- It is important to overrun the simple visualization concept and place digital twins into a much broader context of interaction with different sectors and modalities of engagement.

LESSONS FROM THE CITY – LILLE

Since 2019, Lille Metropole has been cooperating with the CSTB (the Scientific and Technical Center for Building) with the aim of mobilizing growing construction digital technologies to face main challenges across the metropolitan area. To build this urban digital twin, this partnership has started by collecting available data and existing use cases and is currently focusing on building a crossed approach of urban-development and mobility issues. Lille metropole is currently finalizing the selection of use-cases to develop a proof-of-concept infrastructure and, by 2023, it aims to integrate AI algorithms and scaling-up its urban digital twins' strategy.

The "Digital strategy for the Built Environment" of the city of Lille is contributing to the Urban Digital Twin 2023-2025". The objective is to realise a digital twin of the city, by managing its complexity and bringing a better future to its citizens. To do that, the Lille's metropole is approaching digital twins through the Business Information Modelling (BIM) tool and promoting digital twins for the "built environment". It permits to overrun the simple visualization concept and to engage with digital twins in a much broader context, by tackling several fields of investigation such as environmental impact, circular economy, energy, operations and maintenance and citizens engagement. Moreover, it allows better decision making for the urban development, improving operation and maintenance of the built environment, as well as promoting an inclusive environment, in which other aspects, such as the social dimension, could also be included.

“Who’s who”: The network of cities and their DT strengths / focus

3D VIRTUAL CITY SYSTEMS SOLUTION– RENNES

About: Citizens engagement, urban planning and video games imagination.

The Project: Rennes is developing its own Digital Twin platform based on the 3D Virtual City Systems solution. This open source solution is currently in development and will be realesed in March 2023.

More initiatives: The RennesCraft merges urban urban planning with video games imagination, transposing the city on a Minecraft map. It merges the physical and virtual worlds in a playful, collaborative and creative way, so to involving citizens in urban planning.

More information on: From 2017 to 2021 the city led and experiment we led with Dassault Systèmes. More information on the project are accessible here : https://www.3ds.com/insights/customer-stories/rennes-metropole

Contacts: Christelle Gibon, c.gibon@rennesmetropole.fr

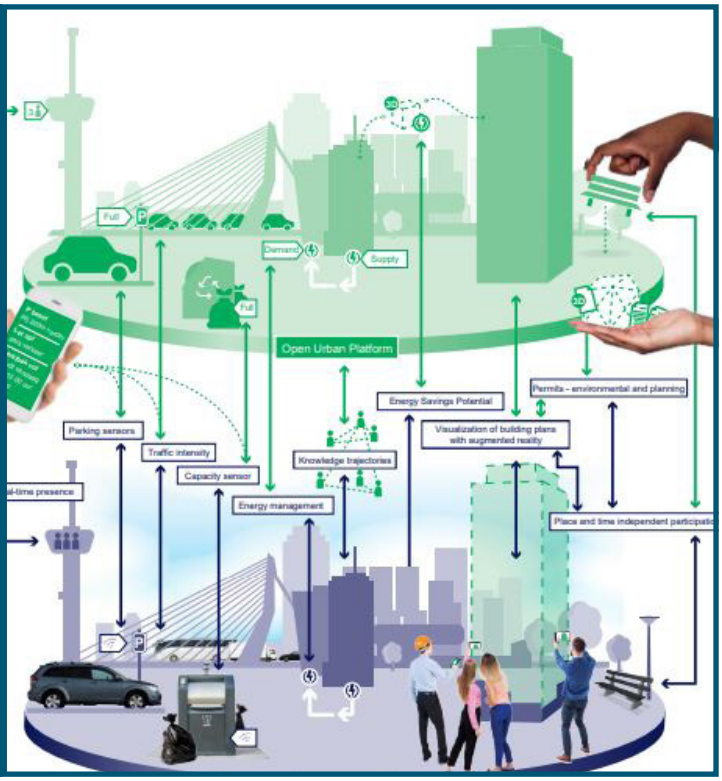
RUGGEDISED, SMART CITY LIGHTHOUSE PROJECT - ROTTERDAM

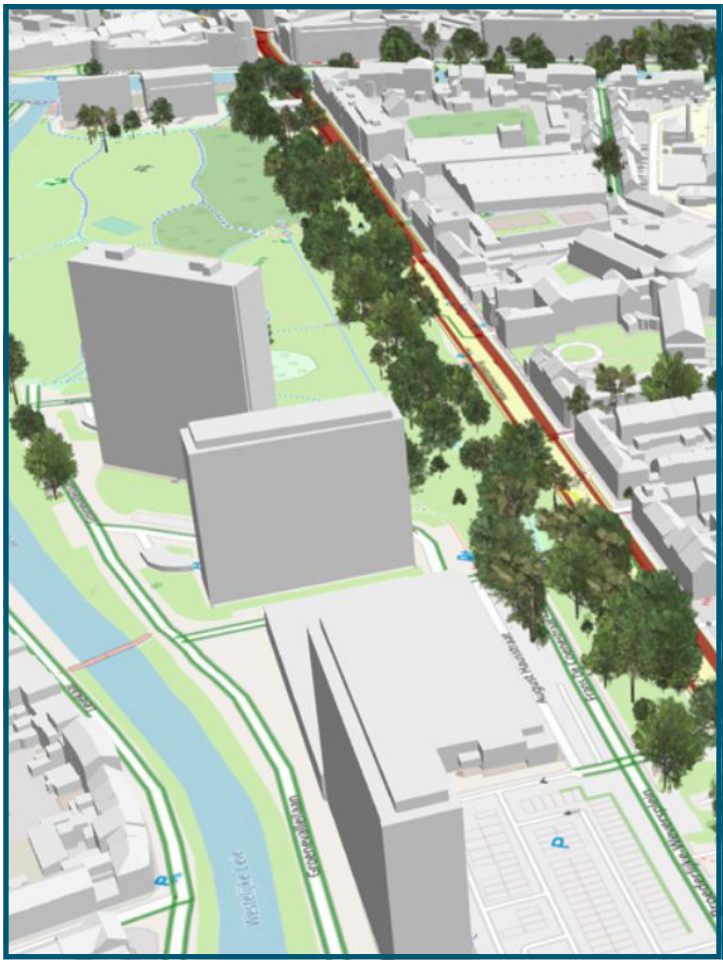
About: 3-D city operations platform, use of energy, open data platform, real time data

The Project: The 3D-city platform discloses and visualizes actual use of energy as well as use over a period of time (by individual buildings as well as the whole area). The 3-D model is connected to the platform, and together with real-time data aims at forming a 3D Digital Twin of the city.

More information on: https://ruggedised.eu/cities/rotterdam

Contacts: Roland van der Heijden, rjmm.vanderheijden@rotterdam.nl





URBAN MOBILITY – FLANDERS REGION (DUET PROJECT)

About: urban mobility, traffic prediction, air quality

The Project: developed under the DUET Digital Twins project, a traffic model calculates what traffic volumes can be expected at the same time in the surrounding streets when one or more streets are closed. The interaction between the traffic model and the air quality model allow to simulate the effects of traffic measures in the city on mobility and the environment.

More information on: https://citytwin.eu/ghent-traffic-model-demo-create-a-delta-layer

DUET Digital Twins project: Pilsen and Athens are also pilot cities of the project. More information can be found here: https://www.digitalurbantwins.com

Contacts: Lieven Raes, lieven.raes@vlaanderen.be

DIGITAL TWINS AND URBAN PLANNING- BARCELONA

About: Public space transformation, urban planning

The Project:digital twins technologies are supporting the digital transformation of public spaces in the city of Barcelona. The "Superilles" project, promotes an innovative street model which reclaims spaces for citizens that were occupied by private vehicles. "Inside AirBnB Data" initiative permits to visualize Airbnb listings and its impact on housing and communities.

More information on: Inside Airbnb in Barcelona https://pareyesv-streamlit-urbana-streamlit-app-5hu19v.streamlitapp.com, and Superilles project https://ajuntament.barcelona.cat/superilles/en

Contacts: Patricio Reyes, patricio.reyes@bsc.es

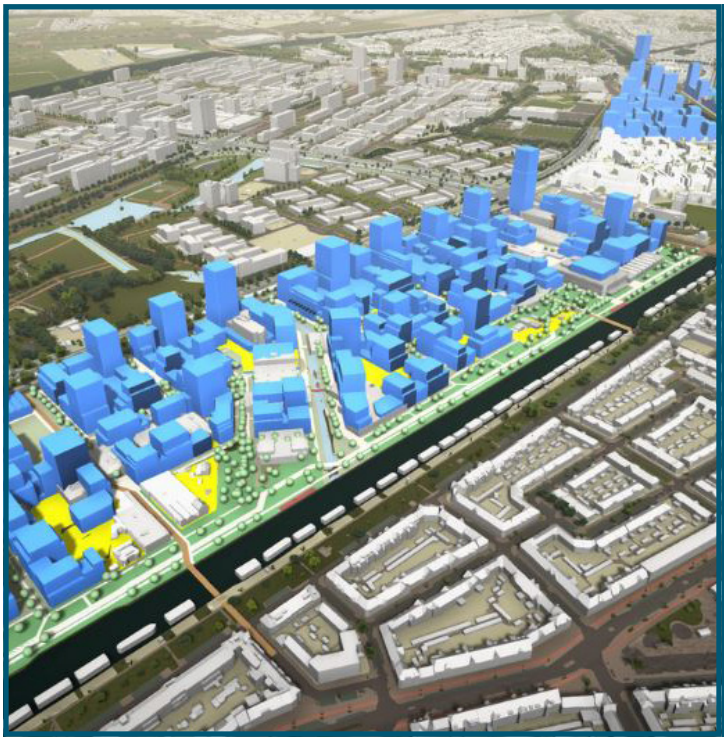
DIGITAL TWINS - MUNICH - MUNICH

About: geodata and sensors infrastructure, "what-if" scenario, digital twins platform, digitalization of public services

The Project: promoted by the Federal Ministry for Digital and Transport, the city of Munich started to develop its Digital Twin in the year 2018. The professional focus is on modelling air pollution control. Overall its focus is on internationally standardised, vendor-independent and open interfaces to create a modular system for the use of digital twins in other cities and municipalities. The Digital Twin is already in use for citizen participation and supports the way to the climate-neutral city

More information on: https://muenchen.digital/twin

Contacts: Markus Mohl, m.mohl@muenchen.de



THE CITY IN 3D – UTRECHT

About: 3D platform, urban planning

The Project: the city of Utrecht is developing their local digital twins used for urban planning. An open source solution that could be applied to different domains such as mobility and healthy urban living. It demonstrates the potential of digital twins in bringing together stakeholders and domains.

More information on: https://www.utrecht.nl/bestuur-en-organisatie/publicaties/utrecht-in-3d

Contacts: Arjan Koelewijn, arjan.koelewijn@utrecht.nl and Marcel Duffhuis, m.duffhuis@utrecht.nl

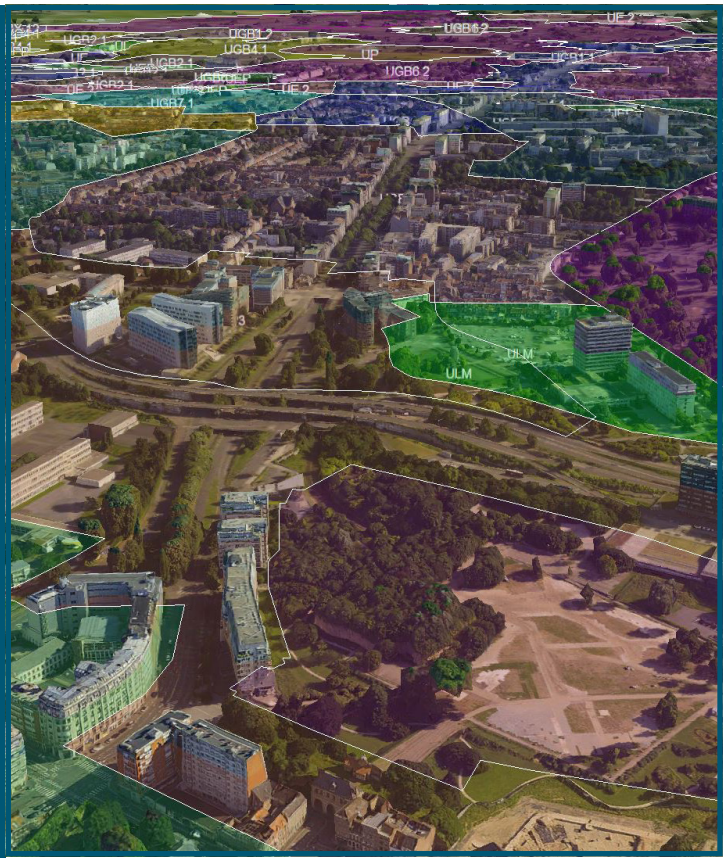
3D PORTAL FOR THE BUILT ENVIRONMENT – LILLE

About: digital twins for the built environment, mobility, urban development

The project: the objective of the Digital strategy for the Built Environment of the city of Lille is to manage the complexity of the urban planning, through a crossed approach of urban-development and mobility issues. This strategy permits to overrun the simple visualization concept and to engage with digital twins in a much broader context,

More information: https://webimaging.lillemetropole.fr/externe/maillage/2020_mel_5cm/App_cesium

Contacts: Rémi Montorio, rmontorio@lillemetropole.fr



Next steps and call for collaboration

This report highlights the work of the Eurocities taskforce on Digital twins. From the discussions around roles and skills needed to support digital twins, from more technical insights into data visualization and semantics, to the promotion of digital twins as participatory tools, this report has disclosed the crucial importance that digital twins are assuming for cities.

Digital twins help smart cities in reassessing their urban planning, transforming how cities are displayed, monitored and managed. Through real-time data and open data platforms, city departments and policymakers can assess the impact of changes to the urban planning, estimating the impact of policy decisions on the urban infrastructure.

Digital twins, however, are complex ecosystems, constituted by multiple layers that, to functions need to be supported by multiple elements, such as open data platforms and open standards. To deliver their promises, digital twins require a collaborative and interactive environment. It is for this reason, that the objective of this taskforce has been to promote exchange of knowledge and experiences, fostering collaboration across cities.

The Digital Forum Annual meeting and the taskforce on digital twins represents unique opportunities for facilitating the interaction between cities. Nevertheless, this represents only the first step. The next steps must be taken by the cities. Cities and local administrations are among the actors that could benefit the most from digital twins. In addition, they are the ones that possess a profound knowledge of their needs and challenges. For this reason, cities need to continue the efforts initiated by this taskforce, and make sure to align they need and leverage the power of the network.

Useful Resources

- Achte, B. (2021, July 22). The data governance role of municipalities within urban data platforms to foster business stakeholder trust. Business Information Management. Retrieved from http://hdl.handle.net/2105/57718
- Digital Twin Cities Centre. Data Models for Digital Twin Cities. https://dtcc.chalmers.se/data-models-for-digital-twin-cities/
- DUET Digital Twins Project. https://www.digitalurbantwins.com/
- Erasmus Centre for Data Analytics- Turning data into value. https://ecda.eur.nl/
- European Commission, Directorate-General for Research and Innovation, Gronkiewicz-Waltz, H., Larsson, A., Boni, A., et al., 100 climate-neutral cities by 2030 - by and for the citizens : report of the mission board for climate-neutral and smart cities, Publications Office, 2020, https://data.europa.eu/doi/10.2777/46063
- European Commission. 2022 Strategic Foresight Report. https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight/2022-strategic-foresight-report_en
- European Commission. Digital Europe Programme (2021-2027). https://ec.europa.eu/info/funding-tenders/find-funding/eu-funding-programmes/digital-europe-programme_en
- European Commission. Digital Twins-Integrated Planning Factsheet (2021). https://smart-cities-marketplace.ec.europa.eu/media/2521
- Gaffon L. The role of Multi-stakeholder collaboration in Building Trust in Urban Data Platforms. Leiden-Delft-Erasmus Centre for Bold Cities. Working paper 6. (2020). https://www.centre-for-bold-cities.nl/uploads/cfbc/attachments/Working%20paper%20%236%20%28Gaffron%29%20-%20The%20Role%20of%20Multi-Stakeholder%20Collaboration%20in%20Building%20Trust%20in%20Urban%20Data%20Platforms.pdf
- Garrido G.E., Burriel S.F., Rowe F., Cucchietti M.F, Reyes P. A city of cities: Measuring how 15-minutes urban accessibility shapes human mobility in Barcelona. Research Gate (2021). https://www.researchgate.net/publication/350483657_A_city_of_cities_Measuring_how_15minutes_urban_accessibility_shapes_human_mobility_in_Barcelona/link/6068e9b192851c91b19fea41/download
- Implementation Partnership Masterportal. https://www.masterportal.org/features-en.html
- Inside AirBnB data in Barcelona. https://pareyesv-streamlit-urbana-streamlit-app-5hu19v.streamlitapp.com/
- Korenhof, P., Blok, V. & Kloppenburg, S. Steering Representations—Towards a Critical Understanding of Digital Twins. Philos. Technol. 34, 1751–1773 (2021). https://doi.org/10.1007/s13347-021-00484-1\
- Marittime Spatial Planning Challenge. https://www.mspchallenge.info/
- Moreno C. Living in proximity, the 15-minute city. Barcelona Metropolis. https://www.barcelona.cat/metropolis/en/contents/living-proximity-the-15-minute-city
- Raes L., Michiels P., Adolphi T., Tampere C., Dalianis A., McAleer S., Kogut P., DUET: A framework for building interoperable and trusted digital twins of smart cities. IEE Computer Society. (2022). https://imec-publications.be/bitstream/handle/20.500.12860/40099.3/DUET_A_Framework_for_Building_Interoperable_and_Trusted_Digital_Twins_of_Smart_Cities.pdf?sequence=5&isAllowed=y
- Van Bemmel M., Three Key Challenges Towards Digital Twin Adoption at Scale (2021). https://living-in.eu/news/three-key-challenges-towards-digital-twin-adoption-scale

EUROCITIES

1, Square de Meeûs B-1000 Brussels

tel +32-2-552.0888 | info@eurocities.eu | www.eurocities.eu

@eurocitiestweet | www.eurocities.eu/food

Task Force on Digital Twins

Lodewijk Noordzij
lodewijk.noordzij@eurocities.eu

Chair, Jochem Cooiman
jh.cooiman@rotterdam.nl