Local Digital Twins: Forging the Cities of Tomorrow

Part of the European Week of the Regions, this workshop aimed to explore: What are Local Digital Twins? How can both small and medium sized and larger cities benefit from them? What steps are needed for the planning, design, and implementation of Digital Twins in cities? How can Capacity Building empower cities in this endeavor? What are the main challenges and potential are for the implementation of Digital Twins?

The session on 'Local Digital Twins - Forging the cities of tomorrow' during the European Week of Regions and Cities 2021 took place on the 13th October and was organised in collaboration with DG CONNECT Technologies for smart communities, the LEAD and DUET H2020 projects working on Local Digital Twins, the Union of Municipalities of Turkey as well as ENoLL. The workshop aimed to explore (i) what Local Digital Twins are; (ii) how both small and medium sized and larger cities can benefit from them; (iii) what steps are needed for the planning, design, and implementation of Digital Twins in cities; (iv) how Capacity Building can empower cities in this endeavour and (v) what the main challenges and potential are for the implementation of Digital Twins. The session welcomed some 85 participants.

The European Commission presented the main policy context and highlighted how Local Digital Twins will enable the next phase of smart and sustainable cities and communities. Local Digital Twins are the virtual representation of a city's physical assets, processes and systems, using data, data analytics and machine learning to help simulation models that can be updated and changed (real-time) as their physical equivalents change. They vary in maturity and capabilities, but this can indeed allow smaller cities to also test their potential. When planning to create a Local Digital Twin, cities need to consider a number of important aspects; the main challenges the city wishes to tackle, the scale and scope of the digital twin, its governance and envisaged functionalities. When designing the digital twin, importantly the data foundation (availability, quality and interoperability) and the technical foundation (IoT, cloud computing, big data, AI, 5G) have to be addressed. The Commission pointed to future funding for an EU Local Digital Twin toolbox, composed of open standard solutions, reference architecture and re-usable tools, through the forthcoming DIGITAL programme.
Stories from the ground started with Sergio Fernández Balaguer from EMT Madrid, presenting the LEAD project (https://www.leadproject.eu/), which uses Digital Twins for low emission last mile logistics in 6 cities (TEN-T urban nodes): Madrid, The Hague, Lyon, Porto, Budapest and Oslo. LEAD helps create innovative business models, make freight storage and distribution more agile, encourages the use of low emission delivery vehicles and develops smart, data-driven logistics solutions. The Madrid use case aims to make city centre deliveries more efficient through optimising delivery routes, exploring alternative (and sustainable) business models, putting in place public-private cooperation mechanisms and improving data management. The possible options (value case scenarios) were discussed with a Community of Practice within the Madrid Living Lab. For the development of the digital twin, challenges are mostly related to data (including data collection, complex noise to calculate, lack of default values, anonymisation, level of data, etc.) and production of results. From the point of view of capacity building/training, the project identified the importance of tools to model and evaluate new distribution models and what impact they have on costs and emissions.

The DUET project (https://www.digitalurbantwins.com/) was presented by Jiri Bouchal from Pilsen. Pilsen has gradually developed its Digital Twin thanks to a number of relevant EU projects (Open Transport Net (https://cordis.europa.eu/project/id/620533), PolliVisu (https://policyvisuals.eu/), S4Allcities (https://www.s4allcities.eu/), etc.). A local digital twin is about connecting legacy systems, better decision making and experimenting by bringing innovation to the public administrations and the private sector. The city has been able to embrace this technology thanks to political support and a strong underlying strategy, technically skilled personnel, advanced technical infrastructure managed by the city as well as state-of-the art unmanned aerial vehicles (UAV). In the DUET project they use the Digital Twin to provide simulation models that demonstrate the interaction between different domains (traffic, air quality and noise pollution), for example modelling how traffic flows would change due to a bridge closure and how and where this would impact air quality. While the journey has not been without difficulties, including the engagement and commitment of stakeholders, the adoption of new technologies in the daily work of city administration, compatibility with existing tools and the need for additional investments, the results are promising. The project has provided the city with new tools to support policy making. With regard to capacity building, developing expertise and skills is a challenge in the long run.

Participants were then split into three different breakout sessions to discuss (i) Digital Twins for sustainable freight; (ii) Digital skills for Policy making and (iii) Skills for Citizens engagement. Moderators of these sessions highlighted the following:

- **Digital Twins for sustainable freight** (*moderated by Carolina Cipres from Zaragoza Logistics Center, LEAD project*): Local Digital Twins for freight require public-private collaboration. A significant obstacle is companies’ unwillingness to share data. It can be solved through anonymisation, removing sensitive data, or data aggregation. Additionally, to gain support for the implementation of a digital twin, interests for private and public stakeholders must be balanced (i.e. private operators may use it for optimisation purposes whereas public entities may have access to information on emissions). Local Digital Twins also face the issue of different logistics profiles in each city. Ideally, Digital Twins should be composed of a models library, and each local Digital Twin should use a combination of those models serving its own logistics profile. Lastly, for Local Digital Twins to be successful, new skills are required, not only in terms of technical background, but also soft skills (i.e. openness to envision how to use this kind of approach for agile and dynamic decision making).

- **Digital skills for Policy making** (*moderated by Lieven Raes from Digital Flanders, DUET project*): While citizens’ participation is important, this raises the question on how to tackle GDPR issues. The DUET project uses data originating from citizens (e.g. through citizen surveys...
or through citizen science), while the PoliVisu project used sensors installed by citizens in their windows that counted the number of cars and pedestrians in a particular street. In these cases privacy by design was used, i.e. counting cars without recording their plate numbers. In the Flanders region, for example, in order to know where people with disabilities live and plan accordingly, anonymised and pseudoanonymised data is used. The first step for a city to develop a local digital twin is to define a policy problem and identify the use cases. Some Digital Twins can be done in 2D, i.e. traffic modelling, whereas others may need 3D models. The COMPAir project which will start in November 2021, will visualise local digital twin data with VR (implemented by the Fraunhofer Institute). The users will have an Augmented Reality view from their phone, thereby bringing citizens closer to the city.

**Skills for Citizens engagement** *(moderated by Dr Francesca Spagnoli, Head of Projects and Capacity Building Program Manager at the European Network of Living Labs - ENoLL)*: There is a clear need to start the capacity building approach locally, and even individually in the different cities and/or local contexts. In fact, each city has its own different needs, demographics aspects, issues affecting various target groups. Modeling the behaviour of the different communities in cities and regions can support the development of local and individual strategies (evolutionary theory). It is important to focus on marginalised communities within cities, as they have different entry level skills (more basic) that need to be considered while drafting a capacity building programme. It is important to start the process by gathering different people in the community and understand what the gaps and needs are for increasing their digital skills, with the final aim of involving them in the process of developing sustainable communities. Partnering with large companies to bring in the connection with the tech sector is essential to support cities and regions to translate digital skills in local contexts. Cultural change is needed in municipalities to show the relevance of digital skills and re-direct their investments and finances towards tailored capacity building programmes. Capacity building programmes can provide effective capacities and resources for improving urban planning, decision making, impact assessment, and change management. Participants indicated their interest in having training on the Living Lab management methodology, especially within the Digital Twins context.

Following these group discussions, participants indicated that data availability, digital awareness at political level as well as data quality and format were the greatest training needs. Many have also raised the need to learn about Living Lab management.

The session then highlighted forthcoming capacity building programmes that will support cities and communities in implementing Local Digital Twins. Claudia Ribeiro, Project Officer at POLIS Network and leader of Capacity Building, presented the **capacity building plans of the LEAD project**. The project is structuring their training material around topics such as (i) Introducing Urban Freight & on-demand last-mile logistics; (ii) Living Labs for Urban Freight and Digital Twins; (iii) Modelling, simulation and data for urban freight planning; (iv) Digital Twin Technologies and (v) Policy & Decision-making. The programme is expected to be ready by the first semester of 2022 and should be delivered through MOOCs, webinars, workshops and other means. Lieven Raes, Adviser at Digital Flanders presented the **capacity building plans of the DUET project**. The project is developing a landing page called [https://citytwin.eu](https://citytwin.eu), which will allow other projects (URBANAGE, CompAir and others) to look at 3D models, engage in gamification and let people understand what Digital Twins can do. DUET partners are also working on a Digital Twins book, entitled ‘Open and Interoperable Local Digital Twins for Smarter Decision Making’. Finally, a MOOC is planned for the first quarter of 2022 (building on the previous PoliVisu MOOC)
([http://www.polivisu.eu/](http://www.polivisu.eu/))

The session was closed by **conclusions** delivered by Noirin Ni Earcain from the European Commission
and Francesca Spagnoli from ENoLL. Discussions have highlighted the need for both digital (data and ecosystem governance, data analytics, modelling, AI/ML, interoperability, etc.) and soft skills (cultural change, new ways of working, etc.) Further work can continue in the context of the Living-in.eu community's Education and Capacity Building subgroup, which will identify and collate existing Learning & Development material, follow up on the Proposal for an EIF4SCC and EIF Skills Report, pursue the research project by Cedefop on skills for smart and sustainable communities and engage with the DT4 Regions project that will organise workshops and create training modules on AI and Big Data.

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