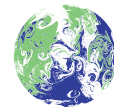


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## BRIDGING GREEN AND DIGITAL AGENDAS IN CITIES TO DRIVE MORE AMBITIOUS AND INCLUSIVE TRANSITIONS

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*On 6-7 October 2021 city representatives and experts from around the world came together in a two-day hybrid conference organised in preparation for COP26 by the Barcelona City Council and CIDOB, in collaboration with the British Embassy in Spain (in accordance with the UK's COP26 Presidency) and the Glasgow City Council (as the COP26 host), and with the support of C40 Cities and Eurocities. The aim was to explore how cities can act as laboratories for integrating and accelerating the green and digital transitions in coherent and equitable policy frameworks. The opening session, which discussed steps for moving towards more integrated urban governance approaches, was followed by three thematic sessions that explored how the two agendas can be better connected to drive change in key sectors of the urban economy: building and renovation, mobility, and the transition to a circular economy. The conference closed with a session on the opportunities that urban data platforms provide for the green transition. Based on the conference results, this briefing outlines how cities can lead the twin transitions while drawing attention to the opportunities and challenges they face in this process.*



COP26 opened with a declaration that inspired ambition while also stressing that urgent action is needed to keep the 1.5C goal of the Paris Agreement within reach. The post-Covid recovery of the world economy is a unique chance to “build back better” and lay the foundations for future green and sustainable growth. The digital transformation of the most energy-intensive sectors promises to be a great enabler and accelerator in this process (Digital Europe, 2021).

Digitalisation and climate change are two closely inter-linked transitions. However, although the so-called “twin transitions” have moved to the centre of many transformative policy initiatives, the connection between the digital and climate agendas is still barely translated into on-the-ground action. Interconnecting the two agendas in a just and sustainable manner will require that they are integrated in ways that leave no one and no place behind, and also that they avoid the risks each presents to the other.

Urban experimentation with, and lessons from the twin transitions are vital for the race to net zero. As climate leaders and hubs of the digital economy, cities are at the forefront of emerging efforts to harmonise the two agendas in ways that are just and sustainable. From develop-

ing urban data platforms that support energy-efficient services and informed decision making, to low-carbon intelligent mobility solutions for all, and scaling up the circular economy, cities are acting to bridge environmental and digital agendas.

### 1. City leadership

The UN-backed, global **Race to Zero** campaign, which aims to rally support from all sub-state and non-state actors to build a coalition of leading net-zero initiatives, recognises cities as critical partners in the fight against climate change. City commitments to lowering emissions have given an important impetus to climate ambition ahead of and during COP26. As part of the **Cities Race to Zero** initiative,<sup>1</sup> over **1,000 cities representing a total of 722 million people** across the globe have committed to halving emissions by 2030 and reaching carbon neutrality by 2050.

1. Cities Race to Zero is a joint project of C40 Cities, ICLEI – Local Governments for Sustainability, Global Covenant of Mayors, Carbon Disclosure Projects (CDP), United Cities and Local Governments (UCLG), World Resource Institute (WRI), and the World Wide Fund for Nature (WWF).

The climate ambition and action of local governments is helping to accelerate change and create tangible visions of a low carbon future. The number of urban interventions to test innovative climate solutions has rapidly proliferated over the past two decades through the support of city networks and other sharing platforms, while also becoming central to cities' governance of the climate emergency. Cities are leaders of what urban scholars Harriet Bulkeley and Vanesa Castán Broto (2013) have called "government by experiment": processes that test new socio-technical and governance climate solutions in urban-living labs and—if they are successful—upscale them.

The deployment of digital technologies features prominently in urban climate experiments, and numerous cities have adopted digital strategies that aim to create

Only by thinking the green and digital transitions together can city governments reap the benefits of digitalisation to stabilise the climate and develop resilient digital infrastructure. Collaborative action across sectors and robust integrated urban governance approaches are needed to bridge the two agendas and manage the interactions, synergies, and contradictions between them. Local governments need to embrace the digital in climate action and vice versa.

Governance efforts to integrate the green and digital agendas in a just and sustainable manner could greatly benefit from being grounded in the Sustainable Development Goals (SDGs) of the UN 2030 Agenda. Cities like **Barcelona** and **Los Angeles** that have adopted the SDGs as a policy compass are already connecting the climate and digital agendas within the broader SDG framework.

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synergies with their sustainability and environmental agendas. This city-level experimentation is crucial if we want to keep the 1.5C goal alive. Often, the technology for mitigating climate impacts is in place but there is insufficient knowledge of effective implementation. Cities are large enough to test and pilot new technologies and processes before modelling solutions, and small enough to discard them without excessive cost if they are not functional. As the level of government closest to the people, and with direct understanding of their needs, cities are also well-placed to engage citizens and other relevant stakeholders in paving new ways for tackling the twin transitions.

### **2. Reanimating the SDGs for cross-sector governance**

The transitions to climate neutrality and digitally optimised urban ecosystems are highly interdependent processes. Digital technologies will certainly make it easier, cheaper, and more enjoyable for citizens to shift towards zero emissions products and services (Lehne et al., 2021). However, digitalisation comes with its own environmental risks. Rising demand for energy-intensive digital devices, the expansion of data centres and cloud computing, and requirements for rare earth metals all have major carbon footprints. In turn, as the world gets hotter and cities become more prone to flooding, digital infrastructure will be among the first casualties.

Four benefits of this approach stand out:

*First*, city governments that are successfully bringing the SDGs into the local arena have achieved an integrated approach that strives for more effective policies by addressing multiple problems at the same time. In particular, the Local Voluntary Reviews (LVRs), which many cities use to measure their progress towards SDG targets, have helped to break down barriers between city departments and have facilitated the alignment of strategies and policies, including budgeting and procurement, to accelerate delivery. These skills, mechanisms, and experiences with cross-sectoral governance could greatly contribute to fostering interlinkages between the green and digital agendas.

*Second*, the emphasis of the SDGs on the three-dimensional nature of sustainable development –economic, social, and environmental (balancing economic growth with social equity and environmental protection)– can facilitate and support a just transition that has real benefits for real people without leaving any person, any business, or any ecosystem behind.

*Third*, cities can build on their experience with the multistakeholder logic of the SDGs to rally relevant actors behind the twin transitions. In the context of the SDGs, cities have learned how to build governance platforms that connect and bring together businesses, universities, civil society, etcetera, to formulate shared visions and priorities,

while also providing participatory mechanisms for citizens. Transferring this approach to the digital transition, **Glasgow City Council** has, for example, set up cross-sector working groups to advance its smart city agenda, consisting of representatives from the public, private, third, and academic sectors.

*Fourth*, the grounding of urban discourse and actions around the twin transitions in the SDGs could potentially make efforts to interconnect the two agendas more inclusively and allow for more engagement of cities from the Global South. The debate and language around the twin transitions is often highly technocratic and Eurocentric, leading to exclusion of cities with fewer capacities (especially digital ones) and resources, and thereby running the danger of reproducing and deepening inequalities. The SDGs, which have become a globally es-

ing digital policies to ensure access to and affordability of high-speed Internet and digital devices, provide digital training and upskilling, and increase public awareness.<sup>2</sup> These types of initiatives narrow the digital divide by making it easier for all citizens to access online opportunities and services, while also reducing transport-related emissions and congestion.

Furthermore, cities are experimenting with ways to combine ecological and digital innovations with social interventions, tackling pressing issues ranging from energy poverty to mobility equity. For example, to reduce green gentrification and protect vulnerable populations, inclusionary zoning regulations, which require or encourage the creation of a certain percentage of affordable or social housing when energy-efficient market-rate housing is built or retrofitted, have proven effective. In the case

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established framework for city-to-city cooperation and city networking, can be a tool to bridge this gap, providing a platform through which cities from around the world can exchange knowledge and experience on cross-sector solutions and integrated policymaking to tackle the climate emergency. While cities in the Global North are leading on technologically advanced pathways towards net-zero, interdisciplinary thinking and policymaking can happen anywhere. For example, while African cities have very limited capacities and resources, they are home to complex informal systems that can inform the deep innovations needed to foster the systemic change that will be the basis for long-term green and digital transitions.

### 3. Towards just and inclusive transitions

Effective and sustainable city plans for aligning the green and digital transitions should have clear guiding principles for ensuring equity and inclusion. Climate and digital justice need to be pursued by maximising the benefits across urban populations, especially for vulnerable groups, and by formulating new mechanisms for citizen engagement and co-production of solutions.

#### Leaving no one behind

A major concern around smart city solutions to the climate emergency has been the emergence of a new digital divide between those who can use intelligent infrastructure in their homes and everyday urban lives, and those who can either not afford to do so, or do not have the skills. Addressing this concern, many cities are develop-

ing smart mobility solutions, common strategies adopted by municipal governments include regulations to ensure that new, private, shared mobility services connect disadvantaged neighbourhoods and improve residents' multi-modal access to public transport hubs. These transversal and holistic approaches need to be stepped up if cities are to meet their 2030 climate targets, and to do so in a fair manner.

#### Co-creating solutions with citizens

Many smart city solutions to the climate crisis have foundered because they did not respond to the needs and concerns of citizens. Such projects have often aimed at fostering behavioural and mindset shifts but without listening to citizens and asking how digital technologies can help them live *better* as well as *greener* lives.

Proper inclusion of citizens and other relevant urban stakeholders in the design of programmes and initiatives is imperative for their success. As the level of government closest to the people, cities have extensive experience in deliberative and participatory processes and are well-positioned to launch climate dialogues with a wide range of stakeholders, informing about options and facilitating co-creation of solutions. This

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2. For example, the **Get Connected Los Angeles** programme, a partnership between the city council and non-profits tackling the digital divide, is helping Angelenos (especially seniors and people living in public housing) to find options for low-cost Internet services, access to computers, and digital literacy services.

is particularly true in fields that are within cities' competencies such as construction, transport, food, waste management, and water.

However, if it is to reach all citizens and stakeholders, public engagement needs to go beyond the traditional town-hall style of meetings. Cities need to develop new tools of engagement and processes that can reach groups that are typically left out of decision-making processes. Crucially, new mechanisms of engagement should provide the right conditions to allow for the active participation of marginalised groups (for example with translation services for immigrant residents and childcare for mothers), and they should also include evaluation procedures that track the inclusion and equity impact of projects over their full lifecycle, from design to implementation and usage.

Cities are working on a number of innovations to foster participation and inclusion in decision making and policymaking around the twin transitions:

## Urban data platforms that pool and standardise data flows across city systems and public and private infrastructure and sensors can facilitate data-driven solutions and informed decision making in key sectors of the green transition.

*First*, digital technologies are proving effective tools for engaging more and new groups, especially from among the young, and to provide greater transparency. The Covid-19 pandemic has given a boost to people's online activities, making it more likely that people join digital public consultation platforms (such as Barcelona's *Decidim*). Further, since in-person meeting became unsafe during Covid-19 waves, digital consultations have become an important alternative.

*Second*, smartphone applications and other digital platforms can support people in navigating, understanding, and switching to the new zero emissions products and services that are becoming available in all areas of life, from heating and cooling to transport and shopping (Lehne et al., 2021). The range of options of zero-emission products and services offered by different providers can be overwhelming, and it is often difficult and time-consuming to assess their environmental and cost benefits. Digital platforms that provide a seamless omni-channel experience can make it easier for people to choose by giving access to a broad range of products and services. They can also support awareness raising, behavioural shifts, and deep listening by highlighting local or circular products, rewarding sustainable consumption, and allowing for feedback on the engagement process. However, until now, the development of digital platforms that coordinate transformation across sectors is largely being left to the market. City authorities that want to have a stake in this

process, need to collaborate with private platform developers to formulate solutions that work for their specific city context, and make sure that algorithms promote the values of equity and inclusion (ibid.).

*Third*, inclusion requires that projects at the intersection of the green and digital transitions are presented in an easily understandable fashion that makes the majority of citizens want to join in. Public engagement and campaigns on subjects like green building, renewable energy, or transport solutions must turn abstract technical information into narratives that speak to people's everyday lives and show them how they can benefit from a digitally enabled net-zero future.

*Fourth*, citizen science projects are another effective method for engaging people in digital climate solutions. For example, in collaboration with NASA and other partners, Los Angeles launched the project *Predicting What We Breathe* which combines satellite and ground data to better predict and mitigate air pollution with a view to

environmental justice. Through distributing air quality sensors among citizen scientists across the city, the project produces hyper-local data on which neighbourhoods are most affected. Similarly, the Mayor of London initiated *Mapping for Change*, a project that involves pupils and teachers in monitoring nitrogen dioxide levels around schools.

### 4. Data for the urban transition

A key insight that city authorities can bring to the delivery of the twin transitions is deep understanding of local contexts. Capturing this knowledge in the form of data will allow AI and machine learning techniques to recognise patterns and support the identification and programming of relevant projects (Lehne et al, 2021). Urban data platforms that pool and standardise data flows across city systems and public and private infrastructure and sensors can facilitate data-driven solutions and informed decision making in key sectors of the green transition, such as building and renovation, the circular economy, and mobility.

Data platforms are likely to become an essential feature of a sustainable and resilient city. Data on urban metabolisms and processes can help not only to monitor "hard" facts like local energy consumption and production, but also to provide information on how liveable or inclusive

a city is. For example, fine-grained mobility and infrastructure data can enable local authorities to assess which neighbourhoods meet the criteria of the 15-minute city model, or whether elderly people have good access to public transport.

However, the high electricity consumption of the digital infrastructure for data generation should be in proportion to the actual problems that are solved. To support this balance, it is essential that cities should regularly update their digital infrastructure to ensure they are using the most energy efficient option; or that they find ways for ensuring that their digital infrastructure becomes a net-zero service provider, for example, by channelling the excess heat generated by urban data centres into district heating systems, as cities like **Helsinki** and **Stockholm** do.

### **Sourcing data, making it useful and establishing trust**

If they are to fully unlock the potential of data for the green transition, cities need to have real-time data, to filter out “quality” data from the mass of data they harvest, and to make the data responsive to the specific problems they are trying to tackle. Crucially, making data responsive to transversal and intersectoral city climate plans is a major challenge that requires sourcing and centralising data from across government departments, as well as from across public and private sector services. In the former endeavour, political leadership from the mayor or another high-ranking official is key to successfully sourcing and analysing data from across city departments with varying expertise. As for the latter challenge, the need for new public-private partnerships geared towards data sharing with the aim of making services both more efficient and environmentally friendly was highlighted. Experience shows that it is more effective to start out small, with just a little but “good” data.

A focus on producing quality data will also make it easier to establish political and public trust in data generation and analysis. Data needs to be translated into reliable information that is useful to policymakers if it is to have a political impact. This is easier to achieve if the processes of data selection and analysis are subject to pre-agreed standards and regulations, and directed towards politically relevant questions and problems from the start.

To gain public trust in data generation and analysis, privacy, safety, and transparency standards are equally important. Transparency requires that data platforms are open source, accessible, and understandable to citizens with varying levels of data and digital literacy. Citizens should not feel threatened or overwhelmed by the data analysis tools and platforms. Rather, they should be enjoyable to use and helpful for managing everyday lives. Making engagement pleasurable and useful is the best way to achieve behavioural and mindset shifts in the long-term. The city of Los Angeles is pursuing this approach by providing **free training sessions** to residents on

how to use open data to advocate for meaningful change in their communities and construct a fact-based narrative around their political goals.

### **From monitoring to scenario modelling**

While digital data is critical for monitoring the status quo of activities in a city and for establishing a baseline from which to assess progress, it can also serve scenario modelling to optimise future decision-making on climate policies. An increasing number of cities around the world have powerful digital data and infrastructure that can virtually simulate urban planning and policy options before acting in the real world.

Accurate models based on building information and big data from Internet of Things (IoT) sensors are making it possible to create digital twins of cities, which is to say, 3D virtual representations that allow for modelling and visualisation (White et al., 2021). The accuracy and usefulness of a digital twin depends on the comprehensiveness and detail of the data that it is fed. While digital twin city programmes are still in their early stages, they already allow city authorities to identify the strengths and weaknesses of proposed plans, prevent problems before they occur, make cost-benefit analyses for interventions, and ascertain the neighbourhoods where projects such as the installation of solar technologies and heat networks would be most effective, or how buildings can best be grouped for refurbishment.

For digital twin programmes to contribute to the creation of sustainable and fair urban policies, and not further deepen inequalities between leading and lagging cities, they need to be open-source and publicly available. Concerning the first point, open and public digital twins of cities that are published online have the potential to boost transparency and citizen participation. Users can “walk” around the 3D model of the city, view proposed interventions (e.g., new cycling lanes and green spaces) and provide feedback or tag problems in their neighbourhood (ibid.). Concerning the second point, open and publicly available programmes can foster solidarity and cooperation between cities. Cities with fewer resources (especially in the Global South) can adopt the programmes or simply view and learn from the scenario modelling.

## **5. We need both, *smart* and *stupid* solutions**

While digital solutions from artificial intelligence (AI), to blockchain and IoT, have the power to enable and accelerate the green transition, they alone cannot solve the challenges cities face. The transition of cities to a greener and more sustainable mode of development, will depend on how effectively local authorities and their partners manage to combine digital and analogue pathways, or as one conference participant put it, “We need both, *smart* and *stupid* solutions”.

Digitalisation and data are a means to an end. The focus of urban climate governance should ultimately be on the outcome. This became particularly clear in the thematic conference sessions that explored how the green and digital agendas can be better connected to drive change in building and renovation, the transition to a circular economy, and mobility.

### **Intelligent and energy-efficient building and renovation**

The built environment is responsible for almost 40% of all greenhouse gas emissions and it is fast becoming a driving force behind global mitigation efforts. To keep the 1.5C goal alive, emissions from buildings need to be reduced by 50% by 2030. To achieve this target, a whole-system approach is needed, considering both the energy emissions of buildings and their embodied carbon emissions, which are associated with construction products and materials.

## **The transition of cities to a greener and more sustainable mode of development, will depend on how effectively local authorities and their partners manage to combine digital and analogue pathways.**

Digitalisation can enable both these processes through, for example, smart sensors and metering that improve energy efficiency, and smart building designs that move away from traditional linear approaches of building-and-demolition models towards circular models. For example, **Amsterdam** is applying smart design to create buildings that are more suitable for the repurposing and reuse of materials, and to create a resource bank where materials can be exchanged.

However, city governments do not have the luxury of choosing between digital and non-digital solutions. “Smart” solutions are those which can meaningfully reduce the emissions of each specific building. Initiatives to retrofit buildings with solar panels can be as, or more, important in specific contexts as testing new digital tools.

### **Enabling the circular city through digital technologies**

Although there is growing political willingness among local authorities to explore circular urban development solutions, there are considerable differences in the understanding and advancement of the circular economy at city-level. Many cities still work with traditional concepts of the circular economy as a synonym for waste recycling. Cities that move beyond this by applying circular approaches to sectors such as building and renovation, food and textiles greatly depend on digitalisation.

A recent OECD report that surveyed 43 cities and regions from around the world, found that 51% of local and regional authorities use digital tools to enable the circular economy

(OECD, 2020). Digitalisation will be key to upscaling the share-and-repair economy in urban areas, aligning future demand and supply, tracking product lifecycles to close loops across value chains, fostering the dematerialisation of the urban economy, and changing the way cities provide services.

Circular approaches to urban development are the most effective way for cities to tackle consumption-based emissions, which receive too little attention owing to the political and public focus on achieving energy efficiency. As major hubs of construction, food, fashion, and other consumer industries, cities have a vital role to play in transforming production and consumption patterns by supporting more efficient use of resources, reuse, repurposing, and remanufacturing. While digital technologies will be critical to these transformations, they also need to be interlinked with more traditional strategies for fostering mindset and behavioural shifts among businesses and people.

### **Mainstreaming digital mobility solutions**

The digitalisation of mobility services is opening new pathways towards decarbonised urban transport systems that centre on automated, connected, electric, and shared (ACES) vehicles. Meanwhile, innovations in Mobility as a Service (MaaS) solutions, platforms that enable users to access, get real-time information on, and pay for a range of public and private transport options, are promising to make urban transport more efficient and less congested. Data from transport also holds great potential to generate more knowledge and understanding on how mobility platforms and sharing systems are reshaping the way people move through cities, and how transport access and equity can be improved.

Yet, there are various obstacles to fully unlocking the benefits of digitalisation and transport data for the decarbonisation of urban mobility. First, city governments (in cooperation with regional and national governments) face the task of regulating private mobility providers in ways that enforce data security and transparency criteria, establish public space use regulations, and integrate new shared mobility services with existing public transport networks without stifling investment and innovation. Better regulation will also be needed to build a relationship of trust with private sector partners and users. Second, data sharing between public and private transport providers will be necessary for the roll-out of effective MaaS platforms. However, data sharing needs to serve public policy goals and foster transport access and equity, rather than profit

maximisation. Third, to fully embrace the digital transformation of urban transport and the opportunities this entails, city governments need to step up digital capacity building among public transport providers. Until now, most of the digital knowledge and expertise rests with the private sector. New public-private partnerships will be one way to end this discrepancy.

## 6. Delivering the twin transitions at city-level<sup>3</sup>

Delivering the twin transitions in cities entails going beyond solely technical aspects. It requires putting the necessary governance in place to enable cross-sectoral interventions; to ensure equity through legal regulation and financial incentives for private sector operators; to foster behavioural and mindset shifts through active participation; to stimulate technical, social, and institutional innovation; and to generate information, data, knowledge, capacities.

## Financing new low-carbon infrastructure and adapting existing infrastructure to low-emission patterns is a major challenge for cities that depends on various public institutions and private financial actors.

As city authorities produce their climate and digital action plans and step up their capability, addressing these various dimensions of the twin transitions will be a major challenge, and one for which many local governments do not possess the required resources, expertise, and competencies.

The following delivery support mechanisms and functions will be vital for unlocking the potential of cities to drive and integrate the climate and digital agendas:

*Stronger public-private partnerships:* City authorities need to place more emphasis on establishing active partnerships with private sector operators and investors that drive the technological solutions they depend on. Engaging tech businesses and investors in a city's climate targets and supporting them in reaching these targets, can accelerate action and incentivise innovation across the whole supply chain. More initiatives like the **City-Business Climate Alliance**, a platform that convenes city governments and private sector climate pioneers, sets joint commitments, and supports the co-creation and co-implementation of projects, are needed. At the city level, this could take the form of a dedicated, independent delivery organisation that brings together relevant local stakeholders and helps them to formulate net-zero shared visions and pathways for reaching them.

*More support from national government:* In the coming decade and beyond, cities will need comprehensive financial, regulatory, and legal help, as well as knowledge and technical support from national governments. National governments should set out what financial resources are available to cities to deliver their climate plans; should support cities with new laws that will make it easier for them to regulate innovations such as shared micro-mobility services; and should establish new mechanisms or institutions to ensure effective knowledge and technical transfers to local authorities. Furthermore, national governments will need to mandate other delivery bodies such as digital and energy regulators and network operators to work with city authorities to ensure consistency between city plans and national infrastructure on the way to climate neutrality (Lehne et al. 2021). City-level infrastructure must fit seamlessly into broader national and international networks while also responding to local priorities, particularly those relating to decarbonisation of buildings.

*Funding support:* Financing new low-carbon infrastructure and adapting existing infrastructure to low-emission patterns is a major challenge for cities that depends on various public institutions and private financial actors. At the same time, city authorities often lack the expertise to maximise available financial resources and to formulate new financing and business models that work for them. For example, they face the problem that many city-scale projects are too large for individuals to pick up, and too small to be of interest to private investors. National and regional governments, as well as private sector partners, can provide support by bundling projects (within and across cities) and with opportunities for leveraging public funding to access private finance. They can also facilitate dialogue with lending institutions and support cities in accessing funding from relevant multilateral development banks (MDBs) and supra-national bodies such as the EU (Lehne et al. 2021).

*Knowledge and support hub:* Digital technology is rapidly evolving, and individual cities cannot be expected to keep up with all developments. At the same time, many cities do not have the capacities to assess and implement newly available (or existing) technology. Great benefits could be gained from the creation of an international knowledge and support hub through which cities can access research and demonstration projects on future technical opportunities, including their cost and deployment potentials; gain advice on which technical options would work best for

3. This section draws heavily, in content and language, on the input paper that was commissioned for the CIDOB conference (Lehne et al., 2021).

them; and consult expert knowledge and resources to help with system modelling and with AI capability to scrutinise local data (Lehne et al. 2021). Such a support hub could also function as a global network for digital twin cities, through which city authorities can exchange knowledge and learning on their digital twin programmes. To optimise knowledge and data sharing, the network should require that all member cities' digital twins are open source, that they use a common 3D framework, and that data is standardised. Multi-national organisations, such as MDBs or the [EU's Joint Research Centre](#), would be well-suited to providing this service and ensuring that cutting-edge technical knowledge is available to all cities.

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