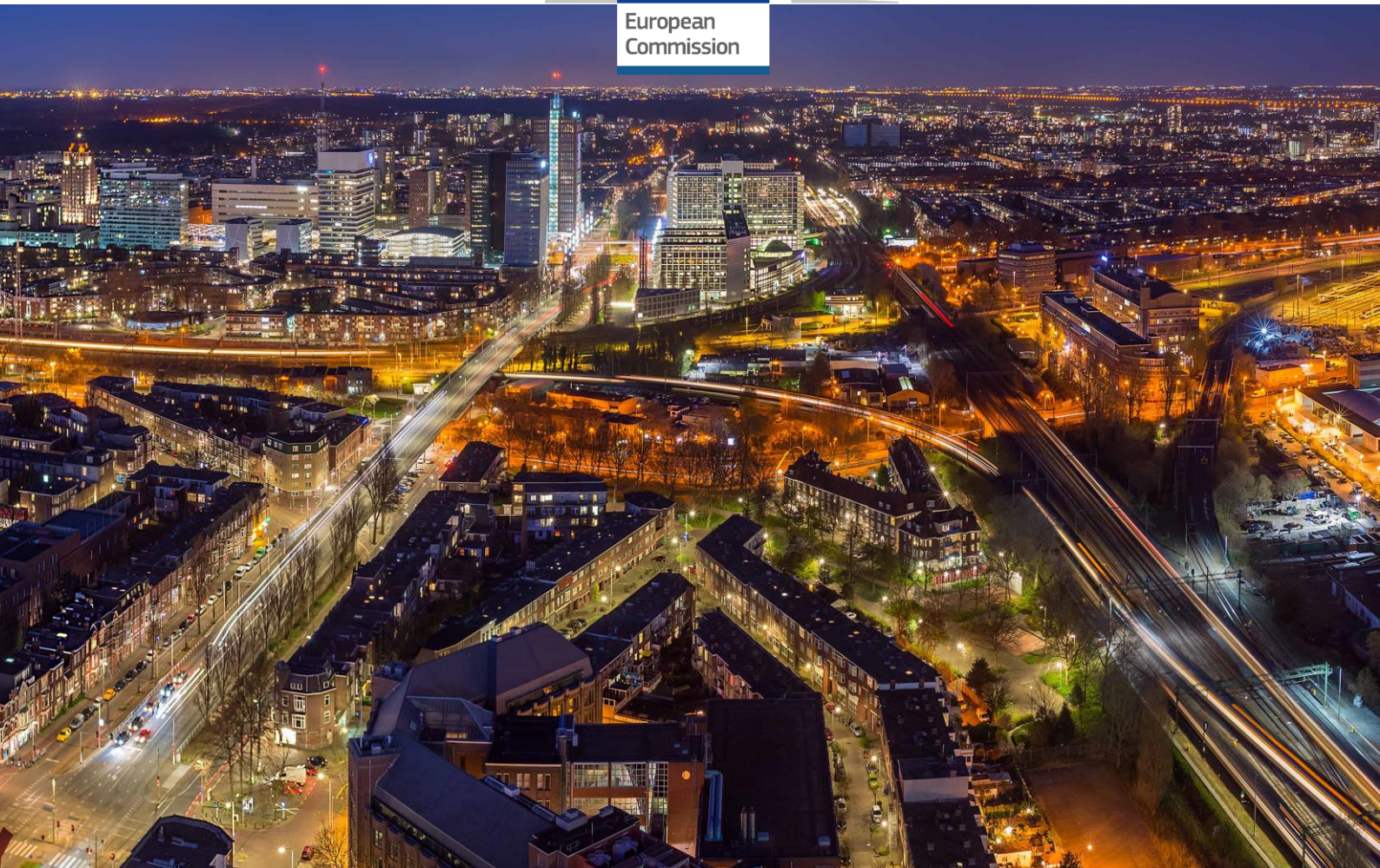




European
Commission



The Productive City Dimension

Turning data into public value

European lessons on unleashing the transformative power of city data

*Regional and
Urban Policy*

This article is part of a series of articles based on the 14 Partnerships of the Urban Agenda for the EU. Structured around the three city dimensions of the New Leipzig Charter (the Productive, the Green, and the Just City), the articles link Partnerships' actions and activities with other relevant EU projects and initiatives supported by cohesion policy (including Urban Innovative Actions, URBACT, or Article 7 cities benefitting from the European Regional Development Fund (ERDF)). The articles demonstrate the key role of cities in the Urban Agenda for the EU, and focus on specific actions they have led and implemented. Overall, the articles aim to showcase practices for and experiences in how different tools and funding support can help cities face their challenges in a strategic way, contributing towards sustainable urban development.

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Turning data into public value

European lessons on unleashing the transformative power of city data

A new window of opportunity

The age of big data and smart city technologies provides city governments with unprecedented potential for data-driven decision making. Committed to constantly developing new urban policy and supporting urban operations, city governments have been using data describing the functioning of urban infrastructure assets and public services for a very long time. However, the widespread diffusion of digital systems has now created a remarkable new window of opportunity.

With many digital solutions being introduced into the built environment to improve the sustainability of urban sociotechnical systems, enormous amounts of data are constantly generated at the city level, and at unprecedented speed. City surveillance cameras, government applications for public services, building automation systems, intelligent transport systems, and smart grids are some examples of digital technologies which are contributing to producing an exhaustive stream of data “that can be harnessed to provide urban intelligence and reshape the practices and processes of public administrations”, creating a fertile environment for innovation and entrepreneurial activity. When attempting to tap into these large streams of city data, however, the opportunity to deliver sustainable value is met with significant sociotechnical challenges, which undermine the capability of urban development actors.

Helping cities to realise the potential of city data is a core commitment of the European Commission, and is clearly embedded in the European policy framework. The key principles of the New Leipzig Charter, for example, recognise that “the digitalisation of processes and their management in cities, including massive, rapidly growing data flows” are pivotal to sustaining urban development. The New Cohesion Policy has established that EU investments in 2021–2027 will aim to build a “smarter Europe, through innovation, digitisation, economic transformation, and support to small and medium-sized businesses”. Priority sectors that will contribute to this evolutionary process will include, for example, the circular economy, advanced manufacturing, cybersecurity, smart city technologies, and big data. Published in February 2020, the European Data Strategy outlines the Commission's vision to foster data-enabled sustainable development. The objectives of this strategy are “setting clear and fair

rules on access and re-use of data; investing in next generation standards, tools, and infrastructures to store and process data; joining forces in European cloud capacity; pooling European data in key sectors, with EU-wide common and interoperable data spaces; [and] giving users rights, tools, and skills to stay in full control of their data”.

Urban Innovative Actions and the work conducted in the context of the Urban Agenda for the EU have been translating this policy into action. A growing number of EU projects and actions have been launched in the framework of these two flagship EU initiatives, which promote sustainable urban development. This article will cover four of these initiatives, focusing on how they have embedded technological advancements into city governance structures to unleash the transformative power of city data.

Rethinking cities as data infrastructures: much more than a technical challenge

Over the past decade, European cities have served as a crucible of data-driven innovation oriented towards mitigating urban sustainability challenges. Many pilot projects have been implemented in urban settings to experiment with the transformative power of data. For example, Internet of Things (IoT) solutions have been tested for real-time monitoring purposes in many application domains, such as waste, energy, traffic, and surveillance. Numerous open government data and government-led data analytics programmes have been launched. Platform solutions have been introduced, including Uber and Airbnb, which operationalise sharing economy principles while drastically altering public service provision.

These urban experiments expose a growing interest among urban stakeholders in city data, and they have brought about an important lesson: fostering responsible and efficient use of city data requires cities to start treating it as a new infrastructure asset. “Data is as important as our road, railway, and energy networks and should be treated as such”. But numerous sociotechnical challenges are preventing cities from embracing this change of paradigm.

In this transition process, collaboration represents one of the most relevant and complex challenges; sourcing value from data demands cooperation among heterogeneous stakeholders representing different sectors, and breaking data silos is essential to ensure effective data collection and processing operations. The Urban Agenda for the EU places emphasis on this collaborative issue by describing a multi-stakeholder and multi-level governance approach as pivotal to sustainable urban development. However, urban stakeholders tend to strive for different (and sometimes conflicting) objectives, and personal motivations and interests may become an obstacle to achieving a shared vision and collective sustainability goals, which require finding a balance between open and proprietary data. In addition, to protect their own interests, city stakeholders are not always willing to disclose or share their data with other organisations.

“Future success rests on the flow of data between systems”, but data sharing among multiple sources is difficult to achieve. Additionally, well-known sociotechnical barriers include poor data quality and lack of quality assessment tools; interoperability issues due to the lack of standard metadata tagging techniques; difficulties in accessing data stored in privately procured IT systems; vendor lock-in issues; legal and ethical issues, especially when handling sensitive data; privacy disagreements; digital skill gaps; technology acceptance; and the frequent failure of scale-up activities. In other words, it is not just about technology.

Rethinking cities as data infrastructures can help overcome these challenges and ensure that urban data management practices are privacy-enhancing, rights-preserving, open, decentralised, and transparent. But this objective can only be achieved by transforming current governance structures, where a human-centric and systemic approach to the management of data infrastructures is urgently needed, together with a solid collaborative ecosystem for supporting its implementation.

Lessons from Europe

In this article, we will present the activities that a group of EU cities are implementing to rethink how city data is collected, shared, and re-used for public good. In discussing these cases, we will extract lessons that we deemed relevant for other cities that are working towards shaping their own data infrastructure.

We will report on the experience of Lyon with MyData, an innovative approach to personal data management, and discuss the development of Feel Florence, a platform that the capital city of the Tuscany region has developed to provide its visitors with unusual urban itineraries and reduce the pressure on key tourist locations. MyData and Feel Florence have been respectively developed in the framework of the Digital Transition Partnership and Culture and Cultural Heritage Partnership of the Urban Agenda for the EU.

The article will also feature projects funded in the framework of the Urban Innovative Actions (UIA) initiative, which provides urban authorities across the EU with the space for experimenting with and bringing to the forefront innovative solutions for sustainable urban development. The projects covered as part of the UIA are Rennes Urban Data Interface (RUDI) and Building Regulations Information for Submission Envolvement (BRISE).¹

¹ Each case will be presented by mainly relying on the data captured during interviews with members of each project team. In total, we conducted approximately 20 interviews. In the discussion of each project, the quotes that we introduced have been extracted from these interviews.

MyData (Lyon, France)

The MyData project has unfolded through a series of interrelated urban development actions. The initial phase started in 2016, with the pilot initiative called MesInfos. Developed by French think-tank Fing, and Tubà, a living lab based in Lyon, MesInfos aimed to help residents of the Greater Lyon area, La Rochelle, and Nantes Métropole to obtain control over their personal data, which many different public and private organisations constantly collect and store. The personal data that companies in the utility sector accumulate on water consumption, energy consumption, waste management, and many other activities, for example.

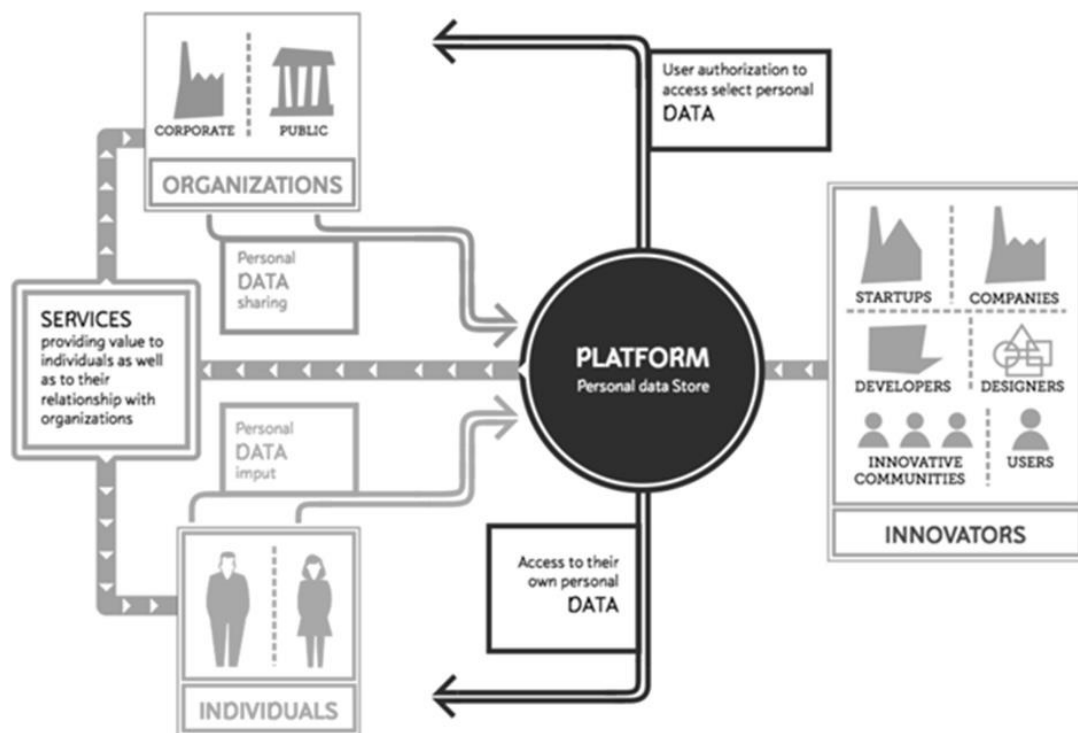


Figure 1: The MesInfo experiment © Fing

Reclaiming citizens' right to manage their own personal data represents an attempt to build a more transparent and trust-based relationship between individuals and their service providers. On the one hand, individuals benefit from having access to their personal data, which can be used to evaluate past actions and help them decide whether to modify their behaviours by making informed decisions. On the other hand, by serving as data providers, organisations can increase consumers' loyalty by developing a better understanding of their behaviours, and they

can use this knowledge to design customised offerings that better respond to the existing demand.

The pilot began well before the General Data Protection Regulation (GDPR) was introduced and, during its implementation, numerous organisations (such as MAIF, Orange, and Enedis) shared the personal data of their consumers. This pilot has been instrumental in showcasing the potential embedded in personal data re-use, and it has helped obtain buy-in from individuals and organisations of the Lyon metropolitan area - an acceptance which was initially difficult to achieve. Over two-thirds of the citizens involved in the pilot activities thought having access to their personal data would be useful.

In 2018, at the end of the pilot project, Lyon Metropole decided to continue advancing the MesInfos vision and run a second experiment called Self Data Territorial. Lyon Metropole partnered with personal cloud service provider Cozy. Together, they developed a technological infrastructure for supporting personal data sharing in the metropolitan area of Lyon. This infrastructure serves as a Personal Information Management System (PIMS). It gives citizens access to personal cloud spaces in which they can find their personal data, sourced from various data-providing organisations.

"Citizens getting back their personal data from organisations is a great idea, but they cannot do anything with it. The technological infrastructure developed by Cozy provides functionalities and services which help create value from personal datasets. Citizens can see their data and they do not need to share it with anyone to make sense of it. They can visualise their data on the Cozy cloud and use it for their benefit."

After the set-up of the technological infrastructure designed by Cozy, Lyon Metropole has created the following two services, which are currently being tested:

Ecolyo: A personal data service that allows citizens to visualize their gas, water, and electricity consumption data, compare their data with an ideal consumption profile, and identify opportunities for trimming their bills. The design of this service, which includes a gamification functionality, builds on a transtheoretical model of behaviour change which aims to stimulate eco-positive responses in citizens.

Pilote: A dashboard that citizens can use to follow administrative tasks and gather personal data to make day-to-day administrative paperwork easier. The objective of this online service is to help citizens to take control over their administrative tasks.

The MyData project has helped citizens in Lyon to experience and become aware of the transformative power embedded in personal data. According to Cozy, one of the key factors that helped increase public awareness is the business model that has been adopted; a “B2B2C (Business to Business to Consumer) business model whereby the service of a personal cloud is provided to citizens through trusted third parties – in the case of MyData, this role is covered by Lyon Metropole.”

This model puts the onus of data management on the metropolitan authority.

At this point in time, the role of the metropolitan authority is to grow the MyData ecosystem by closely working with data providers in the city, encouraging their participation, and creating standardised APIs for data access.

“Despite the presence of technologies and a market supporting personal data sharing, without organisations willing to join the MyData movement and to give back personal data to citizens, the MyData project will not work.”

This, in turn, sheds light on the several challenges that the My Data project in Lyon has faced when trying to gain momentum. The project team highlighted “encouraging data providers to share data and ensuring they meet technical standards” as critical challenges. In addition, they also raised major concerns related to a “lack of business models to support data sharing in local data ecosystems”.

RUDI (Rennes, France)

Delivering efficient and sustainable public services requires processing and drawing insights from large volumes of heterogeneous data – produced by a wide variety of city actors – without compromising on privacy and ethical considerations. RUDI aims to overcome this challenge by developing a data-sharing platform for the metropolitan area of Rennes. RUDI is about developing “a platform ecosystem to support data sharing and its fair usage between local stakeholders, be it public or private actors, researchers, associations, or citizens”. The RUDI platform has been imagined as a ‘data social network’; its ambition is to make a wide range of personal data accessible to local stakeholders for reuse by encouraging data producers to publish statistics and anonymised personal data, making them reusable, and giving citizens a means to access and control their personal data, which is stored by different organisations.

Given their focus on personal data sharing, RUDI and MyData can be considered similar. Both projects stress the importance of adopting a user-centric approach to data sharing. But RUDI's objective is also to stimulate interorganisational collaboration by enhancing business-to-business and business-to-government data sharing. RUDI is expected "to host, give access to, and manage consent of personal data, but also to serve as a system for private providers to share their data and thereby collaborate with other organisations".

Launched in 2019, after being granted €4 million in ERDF funding, RUDI is still under development, but significant progress has already been made, especially in the technological architecture underpinning the project. Envisioned as a federated approach to data sharing, the RUDI platform allows data producers to share the metadata of their datasets on the portal, while maintaining complete control over the datasets at a server on their end – as opposed to hosting entire datasets from different organisations in a centralised database. Any organisation (data user) can then request to access personal datasets, upon viewing the metadata, by using a consent-based mechanism. This approach contributes to creating a human-centric and protected data sharing environment.

"RUDI is a platform that organises user authentication, gathers all meta-dataset from data producers in one place, and organises the rules for publishing personal data."

The RUDI platform is being designed as open-source, and adopts open standards. This approach to development facilitates replicability and ensures data interoperability among the different systems hosted by public and private organisations in the Rennes area.

A key milestone in the project has been the definition of the system architecture, which required significant negotiation and collaboration between the project partners. Work on the software development of the platform is currently in progress. Once again, this demonstrates the pivotal role that multistakeholder collaboration plays in the development of urban data infrastructures. RUDI has benefitted from a growing consensus among city stakeholders.

RUDI's technological architecture will soon undergo beta testing. Meanwhile, the project team is already transitioning to the next phase, where attention will shift from technological requirements to data governance.

"RUDI is not only about designing a platform, but it is more about finding a truly innovative governance model for local data."

Some of the key questions being asked as part of this process relate to the kind of legal body that should be responsible for facilitating data sharing at a local level, the stakeholders that should be a part of this body, who will define the rules to ensure wider stakeholder

participation, trust, and transparency, and whether this data governance body will be designed as a data trust, data cooperative, or a data sharing pool.

As the project progresses, one of the next activities will be to develop new services, such as dashboards or mobile apps, which can help citizens and organisations to visualise their personal data and extract useful insights. To support this action, Rennes Metropole has recently shared a call for interest which aims to widen participation by soliciting French-based organisations to engage with the RUDI project even if they are not located in the Rennes region.

Finally, it is important to mention that RUDI has confirmed that building urban data infrastructures is not just about technology. The challenges that the project team has been facing are manifold, and some relevant examples include convincing beta testers to participate, involving citizens associations, raising awareness of the project, navigating power imbalances between large and small private sector organisations and local authorities, defining a policy for data anonymisation, standardising data identifiers across city's organisations, and determining the lifecycle of the datasets uploaded on the RUDI portal.

BRISE (Vienna, Austria)

The constant influx of inhabitants has seen an increased demand for residential and construction projects in the city of Vienna. The city administration has reported that around 13,000 building submissions are processed annually, resulting in high administration costs and a long processing time for applicants. This scenario is further aggravated by technical and legal regulations, which add layers of complexity to the assessment process of building applications. The metropolitan authority has noted that assessing planning applications against Vienna's sociotechnical requirements by using the traditional paper-based approach has led to a process duration of up to a year.

To cut the duration of the approval process and boost efficiency, the city of Vienna has decided to reconfigure the entire building application process by leveraging information technologies. The result is BRISE, a UIA project which aims to develop an online tool that construction sector actors and planning authorities can respectively use to submit building plans – in the form of 3D models – by using Building Information Modelling (BIM) technology, and to verify the compliance of such plans with existing building regulations using automated tools based on artificial intelligence (AI) solutions. BRISE also brings new augmented reality (AR) functions to ensure that a holistic visualisation of construction projects can be obtained without having to read construction plans.

"BRISE changes the relationship between the planner and the urban authority. Before, it was a one-sided relationship, where the planner submits something and the authority reviews it and sends it back. Now, it is more of a team where they work together, and the feedback loops are much closer and smaller."

A year into implementation, the abovementioned ambitions are progressively being realised. BRISE has linked all relevant city planning and building stakeholders, and the project blueprint has been defined. The BIM services have been outsourced, and a decision has been made to adopt the [Industry Foundation Classes](#) (IFC) standard as a metadata standard; planners will be required to use this standard when submitting their 3D models to the city authority. In addition, the city authority is training the AI text analysis algorithm to build checking routines. The objective is to produce a prototype for testing purposes and subsequent scale-up.

Two important key lessons have already surfaced from BRISE. The first: "you need to get the specialised knowledge out of the head of a few individuals and bring it into the system, so that someone else can use it". In developing a reference model for BIM, the project team has highlighted the high dependence on a single individual who is knowledgeable within the planning authority, and thus responsible for translating existing paper plans into 3D models. It remains to be seen how institutional knowledge transfer and training will be managed among staff to ensure that similar data projects can be sustained in the long term, as well as the completion of BRISE. Second, it is crucial to ensure the wide involvement of frontline workers; those who were going to use the end-product of BRISE were involved from the very beginning, because they knew the context in which such a product would have to operate. This knowledge has proven indispensable.

The project team has also highlighted some relevant challenges. On the technical front, developing the AI-driven text analysis algorithm has represented one of the most difficult tasks: "How do you make AI recognise ambiguous information in law texts?". There are also collaborative challenges created by the COVID-19 pandemic, which has made it difficult for project partners to develop a mutual understanding. This, in turn, has led to delays on the progress of the project. In addition, during our interviews, the project team highlighted another important concern: cultural shift. Planning authorities are required to accelerate the transition to digital. Notably, this process involves behavioural change, technology acceptance, and upskilling activities for staff, who are required to transition from the traditional paper-based and manual work to an AI-based process.

Feel Florence (Florence, Italy)

The Metropolitan City of Florence has a rich cultural heritage, which has always bolstered tourism in the city, with nearly 13 million tourists per year prior to the COVID-19 pandemic. Until recently, providing tourism-related information to visitors has been a task handled independently by local authorities and major tourist centres in the city. As a result, Florence and its surroundings have been serviced by multiple databases powering different websites and mobile applications. Such a fragmented and siloed approach to information dissemination has proven challenging, because it fails to provide accurate city-wide information and manage real-time tourist flows in the city.



Figure 2: The Feel Florence app ©City of Florence

Coordinated by the Metropolitan City and Municipality of Florence, the Feel Florence project is expected to help overcome this challenge, thereby addressing the specific action of 'smart use of data to manage tourist flows', which is laid out in the Culture and Cultural Heritage Partnership. Feel Florence is a digital application; its objective is to introduce a data-informed approach to tourism management in the Florence area. This digital approach helps develop tourist dispersal strategies for managing overcrowding in popular tourist attractions and directing tourists to less visited areas, balancing movement flows within the metropolitan area.

Feel Florence has two main building blocks. The first component is a front-end, which comprises a website and a mobile application. What makes the mobile application distinct from the website is that it provides real-time alerts concerning crowding in nearby areas. The second building block is the back-end; a centralised data storage solution powering both the website and mobile application. Data related to tourist information points (videos, images, and events in the city) is sourced from the 41 municipalities belonging to the Metropolitan City of Florence and stored in this centralised repository system. This data stream is in addition to the information regarding website and application users and the data used to identify crowded areas in the city, currently sourced from public Wi-Fi hotspots and mobile GPS locations.

Developing such a centralised portal for regional tourism-related data collection and dissemination has required a significant collaborative effort among public authorities. Feel Florence truly is "a project of cooperation".

Now approaching its second phase of development, the project team intends to enhance the real-time monitoring functions and advance the predictive analytics capability of the platform. The team has also expressed interest in examining how to ensure interoperability between the Feel Florence platform and Florence's open data portal. Efforts will be oriented towards increasing the participation of stakeholders located in territories around the city - to better manage tourist flows in and out - and advancing data literacy within the municipalities to ensure broader accessibility of the service.

Policy implications: future priorities

The four projects demonstrate that alignment between technical developments and governance frameworks is essential to realise the value creation potential of urban data. Cooperation among city stakeholders is pivotal to ensure the effective functioning of urban data infrastructures, as is the need for a collaborative governance approach that aligns heterogeneous configurations of actors with a multitude of roles, data types, activities, and interfaces. This is a key lesson surfacing from our analysis and discussion with the project teams. As confirmed in current academic and practitioner-oriented debates on urban data infrastructures, however, more investment and effort are required to increase our

understanding of collaborative dynamics in city data projects. Despite this being a factor of the utmost importance, we still know very little.

MyData and RUDI also confirm the need for business models supporting business-to-business and business-to-government data sharing in cities. In this context, policy developments will play a key role in supporting research into the different types of data sharing and governance models emerging in different cities, identifying means to encourage the wider participation of private actors, and incentivising data sharing practices. The results of the Horizon 2020 project Ruggedised are particularly relevant in terms of business models for urban data platforms, and can help guide policymakers and business innovators.

The cases we discussed also confirm the importance of dealing with difficult questions around the selection of governance frameworks and organisational models, like data institutions and data collaboratives, which are required to support democratic and responsible data sharing practices at the city level. A call for clearer recommendations on how to develop legal frameworks for data governance models, like data trusts, has emerged. On this matter, we invite engagement with research activities on emerging models of data governance and the politics of urban data conducted by the Digital Economy Unit of the Joint Research Centre.

Other relevant EU initiatives include the Living-in.eu movement that bring many cities together in their digital transformation, in particular scaling up local data platforms, contributing to EU data spaces and developing powerful Local Digital Twins helping mitigating climate change, notably Rennes and Florence. The Intelligent Cities Challenge (ICC) from the European Commission also supports 136 cities in using cutting-edge technologies to lead the intelligent, green, and socially responsible recovery, notably through the digitisation of public administrations.

We also recognise the need for policies that ensure data sovereignty in public procurement contracts to overcome vendor lock-in issues and ensure accessibility to citizens' personal data held in private IT systems. This will require more strict regulations around ethics, privacy, and open standards, to avoid interoperability challenges.