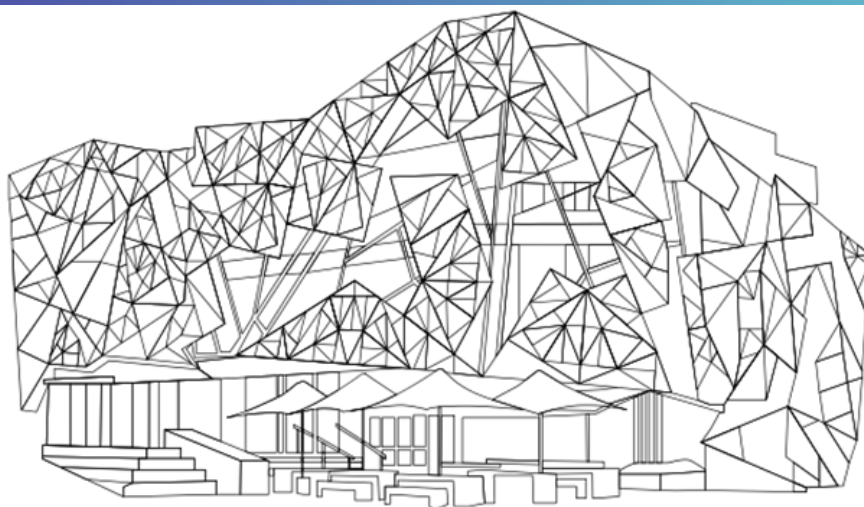


SCIENCE FOR POLICY BRIEF



Exploring Federated Data Sharing in Smart Communities

A role play to test stakeholders' willingness to federate

2026

HIGHLIGHTS

- ▶ *Sovereign and trustworthy data sharing is critical for addressing local and regional challenges that communities face, as well as fostering economic development in European communities. The technical, business, and governance enablers emerging around Common European Data Spaces are paving the path towards federated data sharing.*
- ▶ *Various axes of evolution exist for federating data in local communities: from sharing data within the local administration to extending data space participation to more and different types of stakeholders, and expanding use cases across various domains.*
- ▶ *Stakeholders' willingness to federate may vary, depending on how a data space is designed and implemented. The role play, co-organised by JRC and DSSC and carried out in March 2026, highlighted that stakeholders are more likely to federate if the value proposition is clearly defined and resonates with their objectives. Also, private sector orchestration was considered effective in the case of clearly bounded initiatives.*
- ▶ *Advancing federated data sharing requires further efforts to translate abstract principles, such as sovereignty, into practice, address complex incentives and barriers for data cooperation, understand effective drivers for data sharing capabilities, and foster sufficient balance between market demand and supply.*

Introduction

The European Union is promoting the creation and development of a single market for data to unlock the full potential of data-driven innovation through trusted and secure data sharing [1]. This approach is deeply intertwined with the pursuit of digital sovereignty, ensuring that European citizens, businesses, and public administrations retain control over their data and technological infrastructure, thereby reducing dependencies on a few dominant technology suppliers. Yet, sovereign data sharing is not the end goal itself, but a means to an end. First, local authorities need tools and frameworks to combine data from various domains, such as weather, infrastructure, mobility, monitoring systems, and public health. Such tools could be used to develop and use predictive (or even prescriptive) solutions for anticipating and possibly mitigating the extreme weather that Europe is increasingly facing, for instance by better coordinating responses during such events and natural hazards like wildfires or floods. Second, trusted data cooperation among public authorities, private sector, academia, and civil society can foster the creation of more proactive and cost-efficient services, strengthening local and regional economies and accelerating European innovation. For that, stakeholders need to be able to trust each other, control the use of their data, and protect their interests.

Data Spaces and Federated Data Sharing as Enablers

To reduce fragmentation affecting the seamless use and sharing of data - e.g., differences in national regulations, technical standards, and governance frameworks - the EU is promoting Common European Data Spaces (CEDS) [2, 3] in various sectors, designed as sovereign and interoperable data-sharing frameworks based on federation. Federation, in this context, can be read as the involvement of multiple actors, such as private companies, public authorities, and research institutions, cooperating to exchange data efficiently towards both individual and collective benefits. It could also be extended to federation across different data-sharing initiatives, aligned with the view of a single market for data in the EU. From a technical perspective, federation is implemented by leaving participants in control of the data they share, ensuring access through secure technical interfaces and agreed governance mechanisms. Such a design reflects well the

distributed character of Europe's data economy, with data held by a plethora of different actors. Relying on open-source solutions for federation, especially in critical domains, can provide greater control over digital infrastructure, improved interoperability, and reduced lock-in [4].

However, federation may require context-specific approaches, as in the case of smart cities and communities. In fact, several cases for data-driven services and/or policies relevant to public authorities and other stakeholders in given regions or cities are typically cross-sectoral (compared to use cases of vertical industries). These could encompass domains such as mobility, energy, environment, and public services, where the focus is often on data related to well-localised geographical areas, and its use based on the interests of local stakeholders. As such, the multi-domain attribute of smart community data spaces makes the connection with the other European data spaces (mobility, tourism, energy, green deal, etc.) a natural avenue for federation. Another factor to be considered is the need for robust but flexible governance models that can accommodate the diverse and evolving needs and priorities of actors, especially public ones, acting on behalf of their constituents.

Additionally, sovereignty plays a crucial role in the establishment of CEDS, as it refers to the ability of individuals, businesses, and public bodies to retain control over who accesses, uses, and shares their data, in accordance with European laws and values. Sovereignty is thus shared between a central authority and the constituent units in the federation, each exercising independent jurisdiction within defined domains. This division of sovereignty allows for a balance between the need for unified data governance while still accommodating the diverse needs and priorities of various participants within a data space.

This policy brief explores the implications of federated and sovereign data sharing in the EU, building on the outcomes of a role-play exercise focused on the European Data Space for Smart Communities (DS4SSCC). In the role-play, concrete strategies for the establishment of the data space were discussed, and the concept of federation unpacked.

Data Federation: Drivers and Challenges

The concept of federation addresses a recurring organisational problem: how to enable cooperation

among autonomous actors who share common interests but differ in their capacities, preferences, and internal rules, and who are unwilling to cede full authority to a single centre [5,6]. The idea of federation aims to preserve local autonomy, with benefits in terms of privacy, protecting local interests, intellectual property controls, and reduced dependencies on a single architecture or vendor, while ensuring access to data, services and potential cooperation partners at scale. As such, there is potential for increasing network effects by combining resources, such as data, technology, methodologies, finances, and expertise, among others, to innovate and reach the scale no single actor could (reasonably) do alone.

However, establishing and managing a federation is challenging, particularly when it comes to fostering fair contribution and benefits across actors, managing free riding and power plays, and ensuring technical and organisational interoperability without forcing conformity [7]. Even if standardised digital infrastructures can foster technical interoperability, complexity around stakeholder engagement and alignment, navigating between individual actors' motivations, negotiation of fair terms and conditions, and use case-specific cooperation models can be overwhelming and limit interest in driving federation beyond clearly defined value chains or strong community-bound initiatives.

Furthermore, while EU-wide policy goals concerning the environment, energy demand, competitiveness (to name just a few) provide a clear objective for (cross-border) multi-stakeholder data cooperation, these collective ambitions do not necessarily translate into a sufficiently compelling rationale for individual actors. Local priorities, commercial interests, institutional mandates, and other actor-specific considerations are likely to differ or even conflict with each other, making it difficult to identify arrangements that all parties perceive as mutually beneficial and that individual actors would be willing to invest in. Also, these negotiations do not necessarily take place on a level playing field, as existing market positions, platform dependencies and contractual relationships, among others, shape who can set the terms for cooperation and influence how value is distributed.

These path dependencies, potential asymmetries between ability to create and capture value, as well as overall complexity, create a persistent tension between efficiency and legitimacy as “making it happen” may require simplification, decisive leadership and trade-offs, while “making it right” presumes fairness, inclusivity, and transparency. As

such, in order to fulfil the vision of a single market for data and empower local communities by means of federated data sharing, clearly defined objectives, complementary business rationales for multi-stakeholder cooperation, and legitimate drivers and leadership are crucially needed.

The European Data Space for Smart Communities

The European Data Space for Smart Communities (DS4SSCC) is particularly relevant in the context of federation as it emphasises local autonomy of communities with increasing importance of regional and cross-border cooperation to tackle urban and environmental challenges. As part of the EU-funded deployment action (DS4SSCC-DEP) [8], local data spaces across 44 cities and communities are emerging, often driven and governed by the local and regional authorities. However, progress is slow, ambiguities around what federation means and how to achieve it remain, and evolution seems to follow different directions. The common starting point across pilots is to increase the ability to share data across the city/community administration by addressing technical and governance barriers, inter alia fragmented technology landscape, low data maturity, and lack of innovation culture across municipal departments. As such, several pilots demonstrate the progress towards the creation of what we call a data space for intra-administration data sharing (Figure 1 labels it as a city-space). Data sharing within the local government is the necessary starting point to continue evolving along two different axes: growing the data space with more and different stakeholders, and expanding data sharing and use cases across different domains.

All DS4SSCC-DEP pilots showcase some degree of community ecosystem participation, engaging bigger volume and breadth of datasets, expanding expertise and services, and fostering bigger network effects for collaboration. Notably, the type of involved stakeholders is determined by the local institutional and political context, and, most importantly, by the use cases. However, despite the ambition for EU-wide data sharing, the extension across local communities from multiple Member States seems to be a latent necessity in the pilots. A primary reason for the limited cooperation beyond local communities is the lack of identified rationales for such use cases. Hence, cross-border collaboration is often factual within individual pilots, where architectural and governance artefacts are shared, and in some cases, data sharing is emerging; for instance, to obtain access to higher volumes of data to train predictive models.

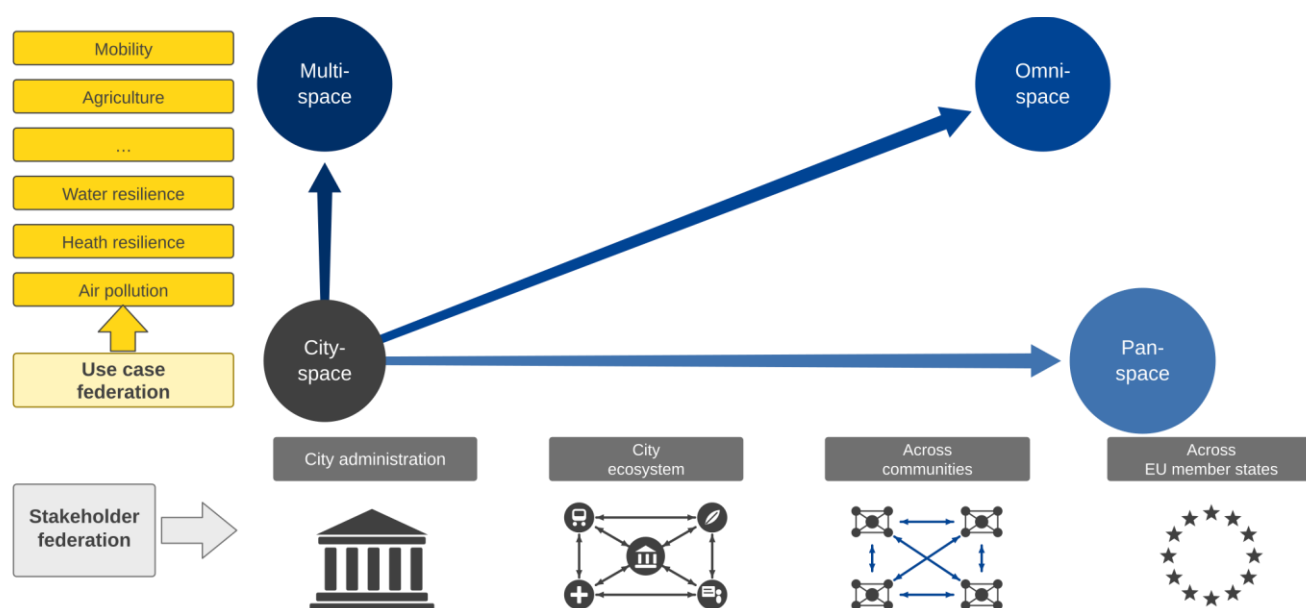
The expansion of use cases across domains seems another logical next step in data spaces' maturity. This has also been encouraged by the EC, requiring DS4SSCC-DEP pilots to share data across domains such as sustainable mobility, zero pollution, energy flows, and others. However, pilots' current evolution along the vertical axis in Fig. 1 is at this stage limited, as their services are often based on data sharing from only two heterogeneous areas. While there's potential for further diversification to increase the value of data spaces, local data spaces seem to lack specific growth strategies to onboard additional datasets and capabilities from other domains. The convergence of the two axes of evolution would bring the vision of a fully federated dataspace for smart communities closer to reality. DS4SSCC-DEP pilot sites are adopting technical solutions, (e.g., the Eclipse data space connector and the Simpl smart middleware) to be technically ready for federating with other data space initiatives. However, the engaged local

stakeholder would have the responsibility to contribute to; (iv) funding and business models.

A role play to test stakeholder willingness to federate

Role plays are a useful tool to explore and test policy scenarios in-depth [9]. To examine the willingness of various stakeholders to come together to form a federation of data spaces to support smart communities, the Data Spaces Support Centre (DSSC) and the Joint Research Centre (JRC) co-organised a dedicated role play in Ispra, Italy, on March 19, 2026, to address this question with a full-day exercise (see Figure 2). The organisers brought together academic experts and representatives from the deployment project of DS4SSCC to work on a scenario that requires multi-stakeholder cooperations across domains and sectors.

Figure 1. Evolutionary paths for local data spaces federation.



Source: own production.

communities have not yet identified strong value drivers for such European-scale data cooperation. As such, the intentional design of technical and non-technical components to make cross-border and cross-dataspaces federation sustainable is yet to come. A systematic approach to federation will require making strategic choices about: (i) shared value that would incentivise participation, beyond individual use cases and single stakeholder groups; (ii) stakeholders to actively drive implementation and operation of the federation (across the various axes); (iii) data space capabilities that each

The scenario

A well-known European developer wanted to build three smart communities in three EU Member States, using solutions built on energy, mobility, occupancy, health, and civic data. These communities would advance sustainability and efficiency, with smart services catering to the needs of residents. Local governments were

Figure 2. Role play at JRC, March 2026



Source: own production.

expected to believe in the vision, treating it as a potential model for other regions. Those governments worked with the developer in a public-private partnership, taking a financial stake. The three regions and their local partners held the necessary data, but these data were dispersed among a variety of sources, many of them locked in silos that were not fully interoperable. Also, the developer was conscious of its GDPR obligations, assuring residents that privacy was critical, and trying to avoid the stigma of a corporate surveillance community. The regions had placed data sovereignty high on the agenda, and the developer agreed to this given that it wanted good relations within its partnership. It still had open questions about whether data spaces were the best way to express that sovereignty.

Players' roles

The role play was conducted with eight 'actors' on the stage, and audience members who could raise questions as long as they took on the persona of a particular stakeholder. The actors represented the following roles with distinct expected responsibilities, mandates and interests: the developer; two data spaces: (a) building occupancy and (b) mobility; one local government; two national governments, with one from the same country as the local government; a consultancy on data spaces; a digital rights advocate.

Options the role play tested

Many actors were motivated to work towards new smart communities (as described in the above scenario), but the roadmap remained unclear. A consultancy engaged by the developer identified

three options, and the players in the role play had to select from one of three:

- 1) **Working with the status quo.** The developer could sign bilateral agreements with each data holder and use local data spaces, where convenient.
- 2) **Joining all data spaces, with or without an intermediary.** The developer could join each local data space individually, optionally through a consultancy with the technical and legal expertise to secure the agreements on its behalf.
- 3) **Creating a federated structure.** The developer could convince a national government or another stakeholder to drive federation, so that all data products and services became available through a common data space, and it could gain access across a federated structure.

Reframing the value proposition and letting the private sector orchestrate

As the session proceeded, it became clear that while federation was interesting conceptually, there were a few blockers that the group needed to address before it would be a viable option. The following summarises some of the key points coming out of the role play, around which there were two key lessons: (i) the value proposition for data spaces exists, but needs to be framed correctly, and (ii) different needs of the public and private sector could be a barrier, but private sector orchestration and a tighter scope seemed to lead

to more concrete results and fewer challenges to address.

Reframing the value proposition

Easing complications around contracting was a weaker value proposition than expected. Many participants believed that joining a data space would eliminate the need to sign bilateral agreements with various data providers, making it easier to access and combine data sets. However, it became quickly evident that the data space would not be able to completely fulfil this function. Yes, onboarding around the data space might provide some pre-alignment of interests that would ease agreement-making. The Open Digital Rights Language (ODRL) and other data space technologies would also make enforcement of those agreements easier. But those agreements would still need to be negotiated and signed.

Digital sovereignty was not an overt driver, but more of a given. At the time that the role play was held, digital sovereignty had become higher on the global agenda, especially of policymakers. Exposure to foreign companies on critical infrastructure was a worrying concern. Despite this, the concept of 'digital sovereignty' was never a true driver of the debate around federation. When an audience member raised the use of hyperscalers to exchange data, this was quickly dismissed by all participants. Rather than talking about sovereignty, resilience of the network was important, and it happened that a digitally sovereign data sharing solution met such criteria. But resilience was still the primary framing for a federated data space's value proposition, instead of sovereignty.

The role of the private sector

Distance between the public and private sector. Despite the briefings explicitly mentioning public-private partnership (and even a facilitator's intervention which made it more explicit that all actors had 'honest intentions' in the negotiation), there was an ongoing disconnect between the actors that were public and privately oriented. Public actors simply had larger and more complex motivations to participate in data sharing, looking to not just offer data and services that the developer would need, but also wanting to ensure that a broader public good was met. There was also an underlying scepticism of the private sector's true motivations. This created tensions with the private sector, who were more focussed

on the use case at hand, namely to get the data required to build the smart community.

Orchestration from the private sector seemed to get better traction where the initiative was more clearly scoped and less complex. Initially, based on the role play's briefings, a national government had the clearest motivation to drive federation. The smart community was described as a test case and part of a broader digitalisation drive for economic competitiveness. The Member State had resources to spend, so budget was also not a limiting factor, and the actor briefing emphasized that they wanted to drive the scenario. Yet, despite the clear incentives, private actors wanted to see the national government only play a minor role, distributing those resources rather than being an orchestrator of the (data sharing) community. Even the local governments from the Member State did not become natural allies for a public-sector-driven solution. The private sector representatives seemed better positioned to advance initiatives efficiently, while public sector entities faced a more complex set of objectives, requirements and constraints.

Conclusions and main takeaways

This policy brief has explored the concept of data federation, focusing on the case of smart cities and communities. Several drivers and barriers have been discussed, including insights from the role play regarding stakeholder willingness to federate across communities and initiatives. As a result, several open questions have emerged that call for design and policy interventions in the future. The following summarises the authors' key takeaways and policy considerations.

How to operationalise sovereignty?

The role play highlighted that sovereignty is an abstract concept whose far-reaching implications may be hard to translate into concrete actions. Participants naturally converged around the possibility of building additional resilience by federating data and infrastructures rather than identifying ways towards more data sovereignty. The solutions developed throughout the deployment of CEDS have the potential to support such efforts while also offering participants greater control over their data, especially when open source technologies and models are prioritised.

To translate sovereignty from a combination of strategic aspirations (resilience, autonomy, security, data protection, etc.) into concrete actions that

data spaces' operators, intermediaries, data providers and users can implement, policymakers should continue to clarify and disseminate the norms – intended broadly as laws, guidelines, certifications and industry standards – that can be applied when procuring data spaces solutions.

How to align incentives for federating?

The role play emphasized that the public sector was driven by the need to ensure a greater good, while private actors were focused on more immediate results. Such a dynamic generated some tension among the actors, especially considering that private actors were deemed more prepared to orchestrate federated data sharing, but allowing only a limited role for public actors. Consensus on the best configuration was not fully reached, highlighting how agreeing on governance mechanisms can be a significant hurdle. The role play dynamic surfaced – although did not fully discuss – the need to think of a data space not as a monolith, but as a set of composable capabilities (e.g., trust framework, data catalogue, data lineage, data products); as such, collaboration between the public and private sectors will not require one of the two parties to take over the operations of all capability layers. Instead, operating models are emerging where a combination of the private and public sectors is the most effective to ensure participation and long-term sustainability. For instance, the private sector could take responsibility for capabilities tied to immediate financial results, such as use-case-specific data products or data infrastructure-as-a-service. The public sector could be responsible for defining the design principles and/or developing and/or operating layers, such as trust registries, that ensure fair and open participation. Industry associations could play a role in designing and curating ontologies and semantic layers that can be coded into schema registries.

Policymakers should continue to fund projects, design deployment vehicles (e.g., sandboxes), and fund and disseminate research that build on real-world experimentation with different governance, operating model, and business model archetypes to align incentives across public and private sector stakeholders.

How to grow and sustain data space initiatives?

While academic research highlights the need for clear objectives, decentralised governance mechanisms, sustained attention to data quality,

transparency, and security within data space deployments, there is still some distance between the regulatory ambition codified in EU legislation and the operational readiness of individual data spaces. In fact, several CEDS are being actively implemented at present [3], and the governance arrangements that will determine access conditions, accountability structures, and enforcement procedures are still being defined. Their long-term viability may depend on the sophistication of their architectural specifications, but also on the capacity of diverse organisations across member states to sustain the coordinated commitment that federated governance requires.

Data spaces stakeholders should be further encouraged to make use of common instruments to self-assess their level of technical and organisational maturity [10] before participating in data spaces initiatives; policymakers can support such efforts through targeted financial incentives and dissemination. The maturity assessment could be a precondition for accessing EU or member states' funds.

How to make the data spaces market scalable from the perspective of both demand and supply?

The need to reduce dependency on technology suppliers, especially non-European ones, does not mean excluding them from the market. The supplier ecosystem plays a strategic role in building the products (hardware and software), and services (advisory, systems integration, operations and support) that can make data spaces more affordable and implementable in a timely manner. A varied supplier ecosystem, including EU-led initiatives (e.g., EDIC), European technology companies, open-source communities, and non-European technology companies, will ensure continued innovation. It will also offer alternative deployment (e.g., public cloud with sovereign controls, private cloud), consumption (e.g. as a service), and pricing model (e.g., subscription based, outcome based) alternatives that increase flexibility, affordability, and scalability, including for smaller public entities and European SMEs. The challenge is to find the right balance between incentivising faster market momentum and scale for data spaces, while avoiding any player to gain a dominant position.

Policymakers should promote actions in three strategic areas to encourage the development of an open and fair data space supply side market for

data and capabilities: (i) further promote the adoption of standards for data interoperability and trust frameworks to reduce technical lock-in risks, (ii) monitor the market evolution to avoid the creation of monopolies or oligopolies, (iii) make financial and non-financial instruments available for open source communities and SMEs to develop solutions for data spaces.

References

- [1] European Commission, *European Data Union Strategy*. COM/2025/835 final
- [2] Farrell, E., Minghini, M., Kotsev, A., Soler-Garrido, J., Tapsall, et al. (2023). *European data spaces: scientific insights into data sharing and utilisation at scale*.
- [3] European Commission. (2026, August 14). [Common European data spaces](#)
- [4] European Commission. (2026, June 3). [The EU open source strategy. Shaping Europe's digital future](#).
- [5] Elazar, D. J. (1987). *Exploring Federalism*. Tuscaloosa: University of Alabama Press. ISBN-10: 0817302409
- [6] Ostrom, E. (2010). *Beyond markets and states: Polycentric governance of complex economic systems*. American Economic Review, 100(3), 641–672.
- [7] Kairouz, P., McMahan, H. B., Avent, B., et al. (2021). *Advances and open problems in federated learning*. Foundations and Trends in Machine Learning, 14(1–2).
- [8] [European Data Space for Smart Communities](#), Pilots overview
- [9] Regeczi, D., Bacco, M., Batura, O., Cecconi, G., Thabit-Gonzalez, S. et al, “A Role Play on the Use of Wearable Data in the European Health Data Space”, European Commission, Ispra, 2025, JRC142160.
- [10] CEN-CENELEC, *Maturity assessment of Common European Data Spaces*, CEN/CLC/TS 18331:2026, July 2026

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European Commission, Joint Research Centre (JRC)

Contact: F. Manlio Bacco manlio.bacco@ec.europa.eu

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