



DATA SPACE FOR  
SMART AND SUSTAINABLE  
CITIES AND COMMUNITIES

## Deliverable 4.1

# Data Space Blueprint and Priority Data Sets

WP 4 – Implementation

**Authors:** Dr. Martin Traunmueller, Thimo Thoeye

**Reviewers:** Sophie Meszaros (OASC), Martin Brynskov (OASC) Justine Gangneux (Eurocities) , Clara Pezuela (FIWARE), Ghazal Etminan (AIT)

**Delivery date:** M8 – June 2023

**Dissemination level:** Public

**Type:** Report



Funded by  
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or of the granting authority. Neither the European Union nor the granting authority can be held responsible for them.



## Revision History

Author Name, Partner short name	Description	Date
Martin Traunmueller (AIT), Thimo Thoeye (OASC)	Table of Contents	15/03/2023
Martin Traunmueller (AIT), Thimo Thoeye (OASC), Ghazal Etminan (AIT)	Draft deliverable	16/05/2023
Justine Gangneux	Internal peer review	23/06/2023
Clara Pezuela, FIWARE	Internal peer review	26/06/2023
Sophie Meszaros, OASC	Internal peer review	29/06/2023
Martin Brynskov, OASC	Internal peer review	30/06/2023

## Abbreviations

WP	Work Package		
MIM	<i>Minimal Interoperable Mechanism</i>		
SSCC	<i>Smart and Sustainable Cities and Communities</i>		
GDPR	<i>General Data Protection Regulation</i>		
EC	<i>European Commission</i>		
EU	<i>European Union</i>		



DS4SSCC	<i>Data Space for smart and sustainable cities and communities</i>		
SSCC	<i>Smart and sustainable cities and communities</i>		



This document is intended for Consortium internal use only, aiming to provide guidance to Project partners for successful project implementation. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

## Table of Contents

<b>1 Introduction</b>	<b>7</b>
1.1 Blueprint for DS4SSCC	7
1.2 Priority Datasets and Use Cases	8
<b>2. Use Cases Workshop &amp; Interview Results</b>	<b>11</b>
2.1 Methodological outline	11
2.2 Interview Results	14
Flanders Smart Data Space	14
Energy & Climate Atlas Helsinki	15
Urban Development Initiative Eindhoven	17
IDEA: Intelligent Data Exchange Alliance	19
SCOREwater	21
Farm2Fork	23
2.3 Workshop Results	24
<b>3. Key Findings</b>	<b>26</b>
3.1 Priority datasets and gaps	26
3.2 Technical overlaps and specifications	27
3.3 Common challenges	34
3.4 Minimum Interoperability Mechanisms in DS4SSCC use cases	36
<b>4 DS4SSCC Data Cooperation Canvas: the Use Cases perspective</b>	<b>45</b>
Data and Data Sources	46
Semantics and Definitions	47
Technical Concepts / Models	47



Technical Infrastructure	47
4.3 Design Architecture & Implementation	48
<b>5 Conclusions and next steps</b>	<b>48</b>
5.1 Conclusions	48
5.2 Next Steps	49
<b>6 Annexes</b>	<b>50</b>
○ 6.1 Annex 1: Use Case list	50
○ 6.2 Annex 2: Priority Datasets from Workshops	58
○ 6.3 Annex 3: Interview question template	60



## Executive Summary

This deliverable presents the findings of an in-depth study on usage and importance of priority data sets as defined by the European Commission<sup>1</sup> <sup>2</sup>(EC), and technologies related to real-world use cases relevant to the Data Space for Smart and Sustainable Cities and Communities, to detect possible overlaps and gaps to shape the blueprint of DS4SSCC.

The document describes the methodology (desk research and stakeholder interviews) that was used to prioritise and to finally identify a shortlist of seven European use cases. The first selection respects an even distribution among geographic location as well as the data space topics relevant to the development of smart communities. These selected use cases were examined employing an interview-approach with relevant stakeholders between March and May 2023. The interview results outline technological standards, specifications and data sets that have been used, reference implementations, scope and maturity, as well as their relation to Minimal Interoperability Mechanisms (MIMs). The results were completed and/or confirmed by the DS4SSCC stakeholder group during an online workshop in March 2023. Whilst the results consider the priority datasets defined by the EC, it was found that communities focus on datasets that have not been covered, related to mobility, energy, health and the green deal.

Findings of this deliverable will be used in D3.2 to develop the Technical Blueprint architecture models for DS4SSCC, by customising the proposed high-level architecture for SSCC data spaces into 3, out of the 7 selected use cases.

The document is structured into five main chapters:

- **Chapter 1 “Introduction”** provides an outline about the blueprint for DS4SSCC and priority data sets, describing how this deliverable relates to the other deliverables of this project’s WP2 (governance) and WP3 (technical blueprint). The chapter further provides an outline of the current EU-defined priority data sets, including the EC High-value datasets and INSPIRE Geo Data Portal, that have been used as a base for evaluation.
- **Chapter 2 “Use Cases Workshop and Interview Results”** provides a short description about the methodological approach, before presenting the

<sup>1</sup> EC High Value Datasets:

<https://digital-strategy.ec.europa.eu/en/news/commission-defines-high-value-datasets-be-made-available-re-use>

<sup>2</sup> INSPIRE Geo Data Portal: <https://inspire-geoportal.ec.europa.eu/>



findings of the interviews of our short-listed seven use cases and our findings from the stakeholder workshop, complementing the picture.

- **Chapter 3 “Key Findings”** presents the findings of the detected priority datasets, gaps, technical overlaps and specifications (Catalogue of Specifications D3.1) as well as the detected gaps of existing reference architectures and common challenges, mechanisms and capabilities to solve them with the introduction of Minimum Interoperability Mechanisms (MIMs).
- **Chapter 4 “Data Space Blueprint”** presents an actionable blueprint, based on our findings.
- **Chapter 5 “Conclusions and Next Steps”** provides an outlook on how these findings will contribute in next working steps, together with findings of other work packages as presented in their deliverables, to define a blueprint and action plan for DS4SSCC.

The following documents are provided in Annex to this document:

- **Annex A** - Use Case list
- **Annex B** - Priority Datasets from Workshops
- **Annex C** - Interview question template



## 1 Introduction

### 1.1 Blueprint for DS4SSCC

Following the definition of the blueprint provided by the Data Spaces Support Center in their glossary<sup>3</sup>, a *Data Space Blueprint* is a *consistent, coherent and comprehensive set of guidelines to support the implementation, deployment and maintenance of data spaces*. Thus, DS4SSCC blueprint defines the guidelines and mechanisms required for the upcoming deployment of the data space. Although this document is aiming at describing the DS4SSCC blueprint, the required elements are spread across other work packages and deliverables of the DS4SSCC initiative. The picture below shows all the elements which form part of the blueprint.

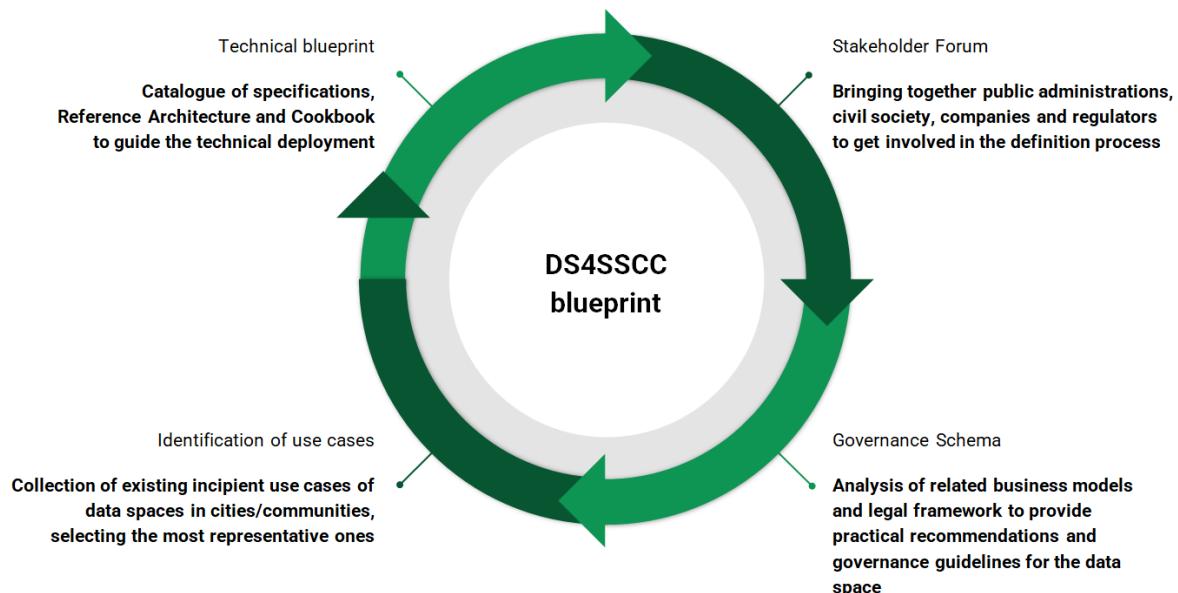


Figure 1. Development of the DS4SSCC blueprint

The stakeholders forum is an important part of the data space ecosystem bringing together relevant players in data spaces. This allows for collaboration and coordination between stakeholders to create a useful blueprint and the success of the data space deployment. The *Stakeholders Forum* is the emerging smart and sustainable cities and communities **data space ecosystem** which is coordinated by

<sup>3</sup> <https://dssc.eu/wp-content/uploads/2023/03/DSSC-Data-Spaces-Glossary-v1.0.pdf>



WP5 and WP1. It builds on the community of the Living-in.eu movement that brings together communities (the demand) with organisations (the supply). In doing so, it expands this community with relevant players in the data spaces ecosystem.

The *Governance Scheme* developed under the coordination of WP2 establishes the **principles and rules** to govern the data space and its ecosystem for the benefit of cities and local communities.

The *Technical Blueprint* developed by WP3 contributes to the overall blueprint with the Catalogue of **Building Blocks**, **Reference Architecture** and **CookBook** to deploy the technical infrastructure for the data space.

WP4 identified the relevant and representative *Use Cases* in Europe that may bring tangible examples of incipient data spaces. The selected use cases showcase their **priority data sets** and commonly used technologies to bring to the data space.

Therefore, the DS4SSCC blueprint is formed by all the above mentioned elements (the ecosystem, the data, the governance, the technology) and all need to be used and followed to deploy a data space for smart and sustainable cities.

## 1.2 Priority Datasets and Use Cases

As various public sector data (such as weather or air quality data) are particularly interesting for third-party creators of value-added services and applications and have important benefits for society, the environment, and the economy, they should be made available to the public. Too often, this is still not the case. With data being a cornerstone of EU's industrial competitiveness, the EC defined a catalogue of high value datasets<sup>4</sup> and the Inspire Geo Data Portal<sup>5</sup>, focusing on high value geo-data. Such specific high-value datasets are available free of charge, machine readable, provided via APIs and provided for bulk download, where relevant and become even more useful when accessible via data spaces, allowing their use for applications on a large European level. Six domains have been identified and datasets attached accordingly, as shown in Table 1.

Domain	Datasets
--------	----------

<sup>4</sup> EC High Value Datasets:

<https://digital-strategy.ec.europa.eu/en/news/commission-defines-high-value-datasets-be-made-available-re-use>

<sup>5</sup> INSPIRE Geo Data Portal: <https://inspire-geoportal.ec.europa.eu/>



GEOSPATIAL	Administrative units
	Geographical names
	Addresses
	Buildings
	Cadastral parcels
	Reference parcels
	Agricultural parcels
EARTH OBSERVATION AND ENVIRONMENT	Hydrography (I)
	Protected sites (I)
	Elevation (II)
	Geology (II)
	Land cover (II)
	Orthoimagery (II)
	Area management / restriction / regulation zones & reporting units (III)
	Bio-geographical regions (III)
	Energy Resources (III)
	Environmental monitoring Facilities (III)
	Habitats and biotopes (III)
	Land Use (III)
	Mineral Resources (III)
	Natural risk zones (III)
	Oceanographic geographical features (III)
	Production and industrial facilities (III)
	Sea regions (III)
	Soil (III)
	Species distribution (III)
METEOROLOGICAL	Observations data measured by weather stations
	Climate data: validated observations
	Weather alerts
	Radar data
	NWP model data
STATISTICS	Industrial production
	Industrial producer price index breakdowns by activity
	Volume of sales by activity



	EU International trade in goods statistics – exports and imports breakdowns simultaneously by partner, product and flow
	Tourism flows in Europe (see Tables 1 and 2 below for variables in scope)
	Harmonised Indices of consumer prices
	National accounts – GDP main aggregates (see Tables 6-7 below for variables in scope)
	National accounts – key indicators on corporations (see Table 8 below for variables in scope)
	National accounts – key indicators on households (see Table 9 below for variables in scope)
	Government expenditure and revenue (see Table 10 below for variables in scope)
	Consolidated government gross debt (see Tables 11 and 12 below for variables in scope)
	Environmental accounts and statistics
	Population, Fertility, Mortality
	Population (see Table 3 below for variables in scope)
	Fertility (see Table 4 below for variables in scope)
	Mortality (see Table 5 below for variables in scope)
	Current healthcare expenditure
	Poverty (see Table 13 below for variables in scope)
	Inequality (see Table 14 below for variables in scope)
	Employment (see Tables 15-16 below for variables in scope)
	Unemployment (see Table 17 below for variables in scope)
	Potential labour force (see Table 18 below for variables in scope)
COMPANIES AND COMPANY OWNERSHIP	Basic company information: key attributes
	Company documents and accounts
MOBILITY	Transport networks
	Inland waterways datasets

Table 1: EC High-Value Datasets

Being defined by the European Commission, a first step of the project was to align these datasets with implemented and existing use cases to identify possible gaps of datasets that have not been included while being frequently used in the wild. In the next chapter we will outline the methodological approach to collect and select use cases relevant to the DS4SSCC and present findings of our in-depth studies.



Finally, we will identify which datasets were found to be highly valuable for implementation purposes, despite their absence in the official high-value datasets lists.

## 2. Use Cases Workshop & Interview Results

As part of this work, use cases that are relevant in the context of DS4SSCC were explored, evaluated, and shortlisted to identify priority datasets and to gain detailed insights on technological specifications, technical readiness, challenges and limitations. Furthermore, a workshop was organised with the stakeholder forum to collect additional, possibly missing input that has not been detected during the interviews. In this chapter we outline methodological steps taken and share insights from our findings.

### 2.1 Methodological outline

To identify priority data sets, technical overlaps and specifications throughout real world implemented use cases, as well as to find common challenges and mechanisms to solve those, a methodology was developed to identify and analyse relevant use cases in depth. The selection of relevant use cases and their priority datasets consisted of three steps:

#### 1. Desk Research:

Source such as Lighthouse Projects<sup>6</sup>, Scalable Cities<sup>7</sup>, Eurocities<sup>8</sup> and the project's own DS4SSCC Survey (WP2, WP3, WP4, WP5) were used to identify use cases relevant to smart cities and communities related topics. These efforts ensured the representation of an even geographic spread and even data space sector distribution and helped to identify 92 use cases across Europe covering 18 countries, forming a solid base for the next prioritisation process steps. The gathered information included *type* of data space sector, *location*, a short *description*, *name of project* the use case is part of (if applicable) and *online link* to the webpage. Table 2 shows that in the context of smart cities and communities related topics most use cases come from cross, health, energy, mobility and public administration sectors. (For a complete list of discussed use cases, see Annex A).

<sup>6</sup> European Commission Lighthouse Projects:

[https://smart-cities-marketplace.ec.europa.eu/projects-and-sites/projects?f%5B0%5D=project\\_type%3Alighthouse](https://smart-cities-marketplace.ec.europa.eu/projects-and-sites/projects?f%5B0%5D=project_type%3Alighthouse)

<sup>7</sup> Scalable Cities: <https://smart-cities-marketplace.ec.europa.eu/scalable-cities>

<sup>8</sup> Eurocities Projects: <https://eurocities.eu/projects/>



Cross	19
Health	10
Agriculture	3
Manufacturing	1
Energy	9
Mobility	23
Financial	2
Public administration	12
Skills	1
European Open Science Cloud meeting the Green Deal objectives	1
	1

Table 2. Selected use case distribution by Data Space strategic fields

## 2. Prioritisation / Short Listing:

A score scheme was developed to prioritise the use cases to be taken further using the following variables: *Minimum Interoperability Mechanism (MIMs)*<sup>9</sup> coverage, *Technology Readiness Level (TRL)*<sup>10</sup> and *technology pervasiveness, number of technologies used, contact for interview* established and available. Scores have been assigned leading to a general score for each use case (colour coded - green/high to red/low - last table column, as seen in Table 3). Overall, higher scores were assigned to projects that cover more MIMs and technologies and have a high TRL. The general score allowed the identification of a short list that had been further refined to define a total of seven use cases.

## 3. In-depth Interviews:

During the third step, the identified seven use cases were discussed in detail by conducting interviews. The interviews took place online from March to May 2023, and lasted a maximum of 45 minutes. (For a complete list of questions see Annex C.) Interviews revealed the priority data sets and technologies that have been used and limitations that were experienced. Below table (Table 3) shows the final selection of seven use cases which will be presented and discussed in detail.

ID	Type	Location	Description	Project name	Link	Points Total

<sup>9</sup> Minimal Interoperability Mechanisms - MIMs: <https://mims.oascities.org/>

<sup>10</sup> European Commission Technology Readiness Level:

[https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014\\_2015/annexes/h2020-wp1415-a nnex-q-trl\\_en.pdf](https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-a nnex-q-trl_en.pdf)



14	Green Deal	Florence	GoalGreen App	Replicate	<a href="https://replicate-project.eu/ict-florence/">https://replicate-project.eu/ict-florence/</a>	16
25	Mobility	Flanders	Flanders Smart Data Space Data Integration for Smart Mobility Flanders Water Dataspace	DCAT AP-VL	<a href="https://www.vlaanderen.be/digitaal-vlaanderen/onz-e-oplossingen/open-data/dcat-ap-vlaanderen-profile-en-validator">https://www.vlaanderen.be/digitaal-vlaanderen/onz-e-oplossingen/open-data/dcat-ap-vlaanderen-profile-en-validator</a>	17
45	Energy	Helsinki	Energy and Climate Atlas		<a href="https://kartta.hel.fi/3d/heating/Apps/Helsinki/view.html">https://kartta.hel.fi/3d/heating/Apps/Helsinki/view.html</a> , <a href="https://kartta.hel.fi/3d/atlas/#/">https://kartta.hel.fi/3d/atlas/#/</a>	16
59	Urban Planning	Eindhoven	Smart Urban Planning, with tools like Digital Twinning & VR and also an Integrated Impact Assessment Model (IIAM) in cooperation with the UDI (Urban Development Initiative)		<a href="https://brainporteindhoven.com/udi/en/digital-city">https://brainporteindhoven.com/udi/en/digital-city</a>	17
77	Health	Barcelona, Göteborg, Amersfoort	SCOREwater develops and tests three large-scale demonstrations cases for collecting, computing and presenting various data tailored to needs of our stakeholders. In Barcelona we initiate a new domain "sewage sociology" mining biomarkers of community-wide lifestyle habits from sewage. In Amersfoort we develop new water monitoring techniques and data-adaptive storm water treatment and apply to water resource protection and legal compliance for construction projects within the Göteborg-case. We enhance resilience against flooding by sensing and hydrological modelling coupled to urban water engineering. We will identify best practices for developing and using the digital services, thus addressing water stakeholders beyond the project partners. The project will also develop technologies to increase public engagement in water management.		<a href="https://www.scorewater.eu/">https://www.scorewater.eu/</a>	18
88	Mobility	Amsterdam	IDEA predictive mobility based on floating car data	IDEA project		17
90	Green Deal	Slovenia	Farm2Fork	Farm2Fork		18

Table 3: Shortlist of final use cases, selected for interviews



## 2.2 Interview Results

### Flanders Smart Data Space

The Flemish Smart Data Space project (Vlaamse Smart Data Space/VSDS) aims to realise a data space for different domains on a regional level, facilitating cities and communities to exchange data by defining standards and best practices. For now, the Flemish data space is focusing on use cases related to sensor data on mobility and water management. The VSDS' future plans are to include crowd management (retail) and roadworks into the data space.

The Digital Agency of the Flemish region has created a technical infrastructure and a support framework which will allow data sharing between cities and communities. This infrastructure is still in its infancy, but Use Cases are already being implemented, for instance, in the city of Antwerp. In time, the ambition is to facilitate all Flemish communities, without requiring a high level of expertise within those communities, still based on the most innovative technologies currently available. The Flemish Smart Data Space is currently providing services to communities and agencies to help them publish their data in line with the framework it has set forward. Currently, they are working on two [Use Cases](#), specifically mobility and water.

On a technical level, the Flemish Data Space introduces Linked Data Event Streams ([LDES](#)) as the core mechanism through which sensor measurements are stored and retrieved. These streams allow the retrieval of measurements in a semantic way, which allows a more fluid definition of the type of data that is recorded.

Flanders has adopted a set of vocabularies which have been co-created with relevant authorities to describe these semantics, the [OSLO](#) vocabularies. These vocabularies are developed as an Open Standard, allowing anyone to contribute and evolve them. They find their origins in the [ISA<sup>2</sup> "Core Vocabularies"](#) developed by DG DIGIT (SEMIC). Importantly, these vocabularies maximally link to existing work, and the Digital Flanders agency is taking great care to re-use prior work when defining them.

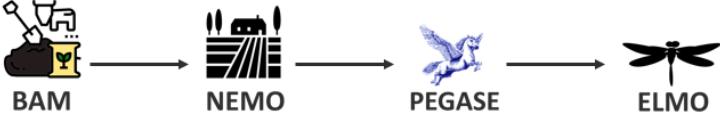
A similar and relevant approach is taken by the [Smart Data Models](#) program, which gathers semantic data models for any type of occurrence. Some Smart Data Models have been already included to map to OSLO vocabularies<sup>11</sup>.

<sup>11</sup> Smart Data Model Oslo on github:

<https://github.com/smart-data-models/dataModel.OSLO/tree/33cec8ac29bfab01bad878aeefc1927bb8130036>



Any semantic ontology may be referenced to provide more information about the occurrences that make up the Linked Data Event Stream.

Standards	Specs	Reference Implementations
<ul style="list-style-type: none"><li>OSLO</li><li>ISA<sup>2</sup> Core Vocabularies</li><li>Smart Data Models</li><li>ISO19156 (water measurement)</li></ul>	<ul style="list-style-type: none"><li>LDES</li><li>SOSA</li><li><a href="#">TREE</a> Spec</li></ul>	<ul style="list-style-type: none"><li><a href="#">VSDS</a></li></ul>
<ul style="list-style-type: none"><li>MIMs</li></ul>	<ul style="list-style-type: none"><li>Scope</li></ul>	<ul style="list-style-type: none"><li>Maturity</li></ul>
<ul style="list-style-type: none"><li>MIM1</li><li>MIM 2</li></ul>	<ul style="list-style-type: none"><li>Water Management</li><li>Mobility</li></ul>	<ul style="list-style-type: none"><li>TRL 7</li></ul>
<b>Data Sets</b>	<a href="#">Datavindplaats</a> , <a href="#">Telraam</a>	
<ul style="list-style-type: none"><li>VMM (The Flemish Environmental Agence) <a href="#">Water Quality</a></li><li><a href="#">Telraam</a> (Mobility Counting)</li></ul>		

### Energy & Climate Atlas Helsinki

Helsinki's Energy and Climate Atlas' initiation started in 2011, when other cities in Finland, such as Turku, had developed a platform to show heat loss in the city. The question evolved on what else, other than heat loss, can be evaluated and shown on a large scale and in a similar manner for the city of Helsinki, benefitting to the city's sustainability? First actions towards the establishment of the Energy & Climate Atlas were taken in 2015 due to the course of a research project on thermal mapping of the Helsinki urban area in 2D. In a next step, the 2D map had been extended into the third dimension to make the outcome more visible, using Helsinki's CityGML model as baseline. The model was developed following an open source approach and enriched with building registry data, including heating mode, building materials, contained square metres and number of building stories, resulting in a total of over 50.000 buildings included in the model, of which 20.000 were found not to be heated.



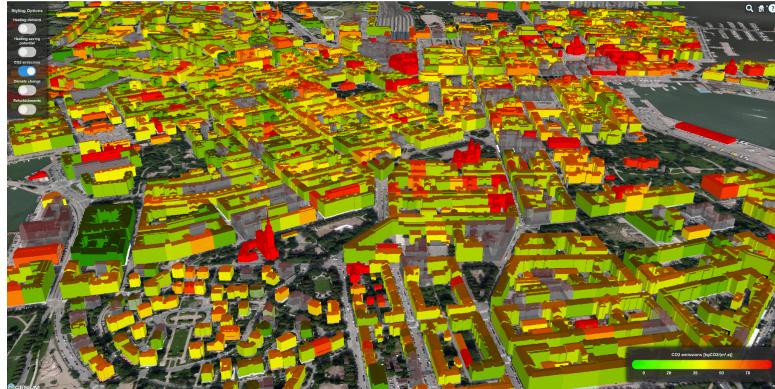
Using building registry data, among other data, led to a number of challenges to the project, based on the format of used datasets. For instance, while most datasets were available in machine-readable format (i.e. .csv, .xls or .shp files) others were available in text formats only (i.e. .pdf). The close cooperation with local universities and the involvement of students at master level, who translated such data into machine-readable formats by hand as part of their theses, allowed the inclusion of such data after a pre-processing step into the model on a quantitative level. However, this process also led to the detection of errors in the data that had to be corrected before inclusion. Other limitations resulted from partially poor data quality. Various significant variables highly interesting to stakeholders, such as the renovation history of the building for instance, did not become clear from gathered data. Furthermore, the rather coarse level of granularity for district heating led to data averaging, which might have biased the outcome. Besides data format and quality related problems, the project faced challenges based on GDPR regulations, especially when including energy data. In these cases, data was available aggregated per building and only with owners' permits. In general, accessing energy data was difficult, even though the owner was the city-owned energy company.

Besides building registry and CityGML the atlas currently includes energy data (district heating, electricity, water consumption, energy efficiency level) and information about building supervision administration. With this information, the atlas aims to suggest actions to improve energy performance on building level and is being used in the currently ongoing mySmartLife Project<sup>12</sup>, to model energy demand and effects of heating mode changes for greater Helsinki. Priority datasets have been identified as any dataset that helps to reach carbon neutrality targets, such as datasets containing information about the building stock (including renovation history) and energy performance (including energy consumption in kWh / building), as used in this project. Furthermore, information on investments and cost of renovations have a high priority, same as the contact details to building owners.

Standards	Specs	Reference Implementations
<ul style="list-style-type: none"><li>• CityGML,</li><li>• Virtual System</li></ul>	<ul style="list-style-type: none"><li>• Open source</li></ul>	<ul style="list-style-type: none"><li>• <a href="#">Helsinki Energy Atlas</a></li></ul>
<ul style="list-style-type: none"><li>• MIMs</li></ul>	<ul style="list-style-type: none"><li>• Scope</li></ul>	<ul style="list-style-type: none"><li>• Maturity</li></ul>
<ul style="list-style-type: none"><li>• MIM 2</li><li>• MIM 7</li><li>• MIM 8</li></ul>	<ul style="list-style-type: none"><li>• Energy</li><li>• Climate</li></ul>	<ul style="list-style-type: none"><li>• TRL 8</li></ul>

<sup>12</sup> mySmartLife project: <https://www.mysmartlife.eu/mysmartlife/>



• MIM 9	
<b>Data Sets</b>	<p>Link: <a href="https://kartta.hel.fi/3d/atlas/#/">https://kartta.hel.fi/3d/atlas/#/</a></p> 

### Urban Development Initiative Eindhoven

The UDI, which stands for Urban Development Initiative, is an organisation that aims to address the complex urban challenges of the 21st century. Within the unique innovation climate of Brainport Eindhoven, they collaborate to find solutions for societal challenges in areas such as health, mobility, energy, food, housing, and safety.

The founders of UDI include the municipalities of Eindhoven and Helmond, the Eindhoven University of Technology (TU/e), Brainport Development, and the Fraunhofer Research Institute. These entities have come together to establish UDI and foster a collaborative environment for tackling the urban challenges of the region.

UDI strives to develop new ideas, technologies, and approaches that can contribute to the sustainable development and improvement of cities. They achieve this through research, collaboration with various stakeholders, the implementation of innovative projects, and the promotion of entrepreneurship in urban development.

The city of Helmond is set to undergo a Leap of Scale and will grow towards 115,000 inhabitants by 2040, a 25% increase from its current population of roughly 90,000 inhabitants. This will require 15,000 additional houses, and 35,000 additional jobs. Such a transformation must be carefully planned and simulated, and this is why departments, the research center TNO and developers from all over the region are coming together to set out a strategy. Data is a key component of this strategy, and Helmond is setting up its Open Urban Platform to be able to exchange



information from different sources to realise different objectives. Some of these are for internal analysis and decision-making, some other focus on collaboration and co-creation with citizens and businesses. The Open Urban Platform manages both public and private sector data, and aims to publish all the gathered data as open data.

The City of Helmond is compiling this data to:

- Create a Decision Support Tool for Strategic City Planning
- Translate complex urban challenges and ambitions into planning and land use

TNO is creating an Urban Strategy which entails

- The creation of a predictive digital twin (for mobility and emissions)
- Combining various scientific models and HPC
- Scenario exploration

Argaleo, a provide company, provides a Digital Twin that will allow:

- Inner City Management / Events
- Visitor Monitoring / Real Estate Developments

Urban Development Initiative (UDI)

Eindhoven, Helmond, TU/e, Brainport Development

- [Digital City](#)
- Energy Transition
- Futureproof Building & Housing

Dutch Societal Innovation Hub (EDIH)

- VNG, IPO + 5 Regional Ecosystems
- European Digital Innovation Hub Public Sector
- Mission drive program (twin transitions)
- Rethink, Reshape, Reconnect

Standards	Specs	Reference Implementations
<ul style="list-style-type: none"><li>• GLTF</li></ul>	<ul style="list-style-type: none"><li>• GLTF (Argaleo)</li></ul>	<ul style="list-style-type: none"><li>• <a href="#">DigiTwin</a> (Argaleo)</li></ul>



• MIMs	• Scope	• Maturity
• MIM 7 MIM 2	• Urban Development • Crowd Management	• TRL 8
<b>Data Sets</b>		
• Base Registry Addresses and Buildings • Base Registry Topography • Height Register • Base Registry Land Use • Demographics • National Database Roads • Demographic Database • Database Spatial Planning • Base Registry Hydrographic Data • OpenStreetMap Roadnet • Energylabels	All these datasets are managed by the “Rijkswaterstaat” and are available on either their <a href="#">open data portal</a> or <a href="#">GeoWeb portal</a>	



*Digital City Program as part of UDI Framework*

### IDEA: Intelligent Data Exchange Alliance

Road and tunnel closures due to constructions are managed and monitored by the city, enabling necessary actions to continue a traffic flow as smooth as possible. However, reality shows that collected data about planned roadworks can be very broad and not accurate (due to last minute changes and delays of construction for instance) and hence, can not be trusted by routing providers. Led by the Amsterdam City Council, IDEA (Intelligent Data Exchange Alliance) brings together public and private sector in the Netherlands (Amsterdam being one of two current use cases) aiming to provide more precise and trustworthy information for service providers (i.e. for routing application) and cities on road and tunnel closures to avoid unforeseen challenges for city traffic.

The platform combines floating car data (as collected by BeMobile or Waze, for instance) and official data on road construction and tunnel closures provided by the



City of Amsterdam to establish a trusted environment for navigation system providers to incorporate such data in their routing systems. The trusted environment is being created by the creation of an API sending automatically a data package with the information of road closure, triggered by the action of closure of it. The information is being sent as trusted by the API to all navigation system providers (such as Google or TomTom). IDEA is based on National Data Warehouse for Traffic Information (NDW)<sup>13</sup> data platform, a database of both real-time and historic traffic data in the Netherlands and uses DATEX2 standards. Developed data scientific machine learning (ML) algorithmic procedures are provided to NDW via containers and provide increasingly accurate results the more frequently a road is being used due to increased machine learning effects.

As a platform, IDEA is not limited to a city or a city size. Besides Amsterdam, and The Hague, the system is currently being extended to 15 other cities in the NEtherlands, which potentially can be scaled up to European level, nested within the NAPCORE (National Access Point Coordination Organisation for Europe) environment), coordinating and harmonising more than 30 mobility data platforms across Europe.

Standards	Specs	Reference Implementations
<ul style="list-style-type: none"><li>• DATEX2</li><li>• NAPCORE</li></ul>	<ul style="list-style-type: none"><li>• NDW (National Data Warehouse for Traffic Information data platform)</li></ul>	<ul style="list-style-type: none"><li>• <a href="#">IDEA</a></li></ul>
MIMs	Scope	Maturity
<ul style="list-style-type: none"><li>• MIM1</li><li>• MIM 2</li><li>• MIM 7</li><li>• MIM 8</li></ul>	<ul style="list-style-type: none"><li>• Mobility</li></ul>	<ul style="list-style-type: none"><li>• TRL 8</li></ul>
Data Sets	Link: <a href="https://www.ndw.nu/onderwerpen/idea">https://www.ndw.nu/onderwerpen/idea</a>	
<ul style="list-style-type: none"><li>• BeMobile Floating Car data,</li><li>• Amsterdam / The Hague City CouncilPlanning data (Official data on road</li></ul>		

<sup>13</sup> NDW National Data Warehouse for Traffic Information:

<https://company.intertraffic.com/?a=qSXzuB2EeRj07NjknojLtHuhA79ec9Xn6UUd1RehS%2F8%3D>



<ul style="list-style-type: none"><li>construction and bridge closure),</li><li>• Rijkswaterstaat (National Road Authority) road work datasets</li><li>• Waze Trusted Messages</li></ul>	<p>Geplannede wegwerkzaamheden &amp; afsluitingen Melvin, LTC, SPIN, NMS, VM-IVRA</p> <p>Real-time situatie o.a. Floating Car Data </p> <p>=</p> <p>IDEA Real-time, hoge kwaliteit, gevalideerde data voor service providers en wegbeheerders</p>
--	---

## SCOREwater

SCOREwater focuses on enhancing the resilience of cities against climate change and urbanisation by enabling a water smart society that fulfils the Sustainable Development Goals 3, 6, 11, 12 and 13 and secures future ecosystem services.

SCOREwater develops and tests three large-scale demonstrations for collecting, computing and presenting various data tailored to the needs of their stakeholders. In Barcelona the project initiated a new domain “sewage sociology” mining biomarkers of community-wide lifestyle habits from sewage. In Amersfoort it developed new water monitoring techniques and data-adaptive storm water treatment and it applies to water resource protection and legal compliance for construction projects within the Göteborg-case. The project aims to enhance resilience against flooding by sensing and hydrological modelling coupled to urban water engineering. It identifies best practices for developing and using the digital services, thus addressing water stakeholders beyond the project partners. The project will also develop technologies to increase public engagement in water management. Moreover, SCOREwater will deliver an innovation ecosystem driven by the financial savings in both maintenance and operation of water systems that are offered using the SCOREwater digital services, providing new business opportunities for water and ICT SMEs.

The three use cases are detailed below:

### Amersfoort: Flooding

SCOREwater in Amersfoort will focus on improving the detection of flash floods while reducing environmental impacts through:

- Prediction models and early warning systems for flash floods;
- decision-tool (case-based reasoning) for reducing environmental impact considering risks, economic, operational and environmental information.



## Barcelona: Sewage

SCOREwater in Barcelona will focus on reducing wastewater management problems with the vision of improving public health:

- Predicting sewer clogging
- User behavior profiling and analysis;
- Correlate behavior with water quality measurements, and subsequent actions to mitigate health risks and hazardous events.

## Göteborg: Industrial

SCOREwater in Göteborg will focus on managing water pollution in the industrial sector by:

- The prediction of water pollution based on the combination of meteorological data and water quality sensors;
- Predictive maintenance of local water treatment equipment.

Standards	Specs	Reference Implementations
• NGSI-LD	• UWWTDxx • WFD • Smart Data Models	<a href="#">Score Water Platform</a> <a href="#">Score Water Portal</a>
MIMs	Scope	Maturity
• MIM1 • MIM2	• Water management	• TRL7
Data Sets	The ScoreWater Portal was developed by Civity and is called “DataPlatform”. This software is based on CKAN.	
• Soil Moisture Levels • Water Levels • Water Quality • Flooding Risk Maps • Data sets are collected for three different pilots, Amersfoort, Barcelona and Göteborg and may depend on the local		



use cases. However, all sensor data was collected with similar or the same sensor devices and are accessible through the ScoreWater platform.



## Farm2Fork

Developed within the LokalnoGOR project<sup>14</sup>, Farm2Fork application initially aimed to connect the city of Kranj as partner, schools and kindergartens to farmers, which has been now extended to the retail market providing a B2B setting between producer and customers. The aim is to provide a short food supply chain that can only have one intermediary. In doing so, the project supports local self sustainability for food from early 2020 by providing a backend / DevOps / frontend solution. Farm2Fork uses TMForum API's for communication between front- and backend based on REST. The TMForum payment API is being used, while missing prepayment, and PayPal included.

The application works mostly with small producers, so very little data is available or being collected. Mostly Excel sheets with price lists are provided, where farmers have direct access to, via admin module or can get support by the project team. Modules translate the format of input data (by the farmers) into the project's own data format to be implemented in the platform. The application is built with Python and C++ scripts, uses regGIS and AWS server components for content broker and as data storage. Generated data can be exported as .csv from Wordpress. Identified priority data sets are data sets on product and process information of local products, available as open source.

There is a unified taxonomy for products registry of local products project by the Chamber of Commerce and the approach is already interesting to large producers as well. However, the lack of data as well as the need for manual interventions can be challenging for future scaling.

<sup>14</sup> LokalnoGOR: <https://www.kranj.si/lokalno-gor>



Standards	Specs	Reference Implementation
<ul style="list-style-type: none"><li>regGIS</li><li>REST</li></ul>	<ul style="list-style-type: none"><li>Python</li><li>C++</li><li>Mobile apps regnity</li><li>Microservices (self dev)</li><li>AWS</li><li>TM Forum</li><li>Excel</li></ul>	<ul style="list-style-type: none"><li><a href="#">DIH Agrifood Cooperation Platform</a></li></ul>
MIMs	Scope	Maturity
<ul style="list-style-type: none"><li>MIM 3</li><li>MIM 4</li></ul>	<ul style="list-style-type: none"><li>Food</li><li>Green Deal</li></ul>	<ul style="list-style-type: none"><li>TRL 8</li></ul>
Data Sets	<p><a href="https://itc-cluster.com/dih-agrifood/">https://itc-cluster.com/dih-agrifood/</a></p>   	
<ul style="list-style-type: none"><li>Pricelists (Excel)</li><li>Product export from Wordpress (CSV)</li><li>Unified Taxonomy of local products, created by the Slovenian Chamber of Commerce</li></ul>		

## 2.3 Workshop Results

The workshop at the third stakeholder forum on April 12th, 2023 started off with a presentation about past work and current progress related to WP4, followed by an interactive part with the stakeholders. The aim of this exercise was to identify priority data sets other than those in the shortlist. This part was organised in two 35-minutes breakout sessions, using Miro Boards to share experiences and opinions on priority data sets, missing data and relevant use cases. Participants were asked to give detailed information and to share links. Each of the main data space domains were provided as potential use case subjects: *Health, Agriculture,*



*Energy, Mobility, Public Administration, Green Deal, Skills, Financial, Manufacturing, Tourism.*

The focus of use cases / datasets were clearly on Energy, Mobility, Public Administration, Green Deal, Health which have been discussed within the group. After returning, both breakout room organisers presented a summary of the respective workshops.

While the EC decision defines priority datasets by topic, the research conducted in the scope of this deliverable made it clear that it is often ambiguous for local Cities and Communities which are the contributing parts of each of these priority datasets, and especially who governs them. In many cases, cities and communities need to rely on regional or national agencies and institutions to compile such a dataset, and depending on the local context, this may incur difficulties in terms of granularity, quality, accessibility and even availability of the dataset on a supra-local level.

Therefore, most cities and communities maintain a local version of each of these priority datasets, which can be laboursome. As stated in the introduction, there is a clear trend for cities and communities to focus on datasets pertaining to mobility, energy, health and the green deal. To illustrate, we highlight the results gathered from the Stakeholder Forum during which public servants working with data were asked to define their priority datasets within their city, community or project (Fig.2):

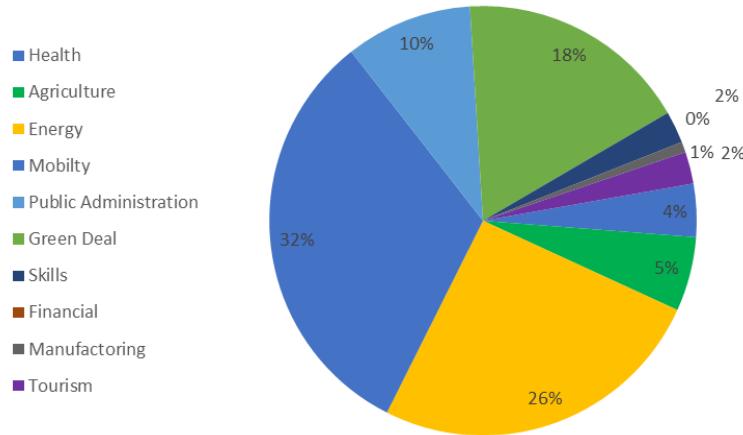


Figure 2. Dataset domain distribution, as identified at the Stakeholder Forum Workshop (April 2023)

The distribution of priority datasets indicated by the Stakeholder Forum clearly indicates the gaps between the different domains.



### 3. Key Findings

Based on the above we conclude the following key findings that will help us in following steps to shape the blueprint for DS4SSCC.

#### 3.1 Priority datasets and gaps

Although most of the priority datasets derived from interview results and the workshops are relatable to datasets and domains as defined by the European Commission, we were able to detect the following priority data sets, existing gaps - as for instance, data that has not been tagged as priority data set by the EC, in bold. While the European Decision on Priority Datasets focusses on making public data available free of charge, we can clearly identify that some of the use cases we have researched have a need for privately-owned datasets to be available as well:

Detected priority data sets	Related Dataset (as defined by EC)	Domain
Floating car data		Mobility
Planning data (road closure)		Planning
Energy data	Energy resources	Earth Observation and Environment
Building registry	Buildings	Geospatial
3D City Model	Buildings	Geospatial
Weather data	Weather alerts	Meteorological
Water Quality	Water quality	Water
Soil Humidity	Soil	Soil
<b>Vehicle / pedestrian count</b>		Mobility
Water levels	Water levels	Water
<b>Opening hours</b>		Individual / Commercial
<b>Housing Quality</b>		Planning
Land Use	Land Use	Land Use



### Product Descriptions

Individual / Commercial

Detected gaps of priority datasets, that have not been listed as priority dataset by the European Commission, include:

- Floating car data
- Planning data (road closure)
- Vehicle / pedestrian count
- Opening hours
- Housing quality
- Product descriptions

Most of these are mainly publicly owned, but floating car data, opening hours and product descriptions are typically private.

## 3.2 Technical overlaps and specifications

The in-depth analysis of these different cases has contributed to a thorough understanding of the real-world ICT architectures being used in different city or community settings. Some new technologies, specifications and standards were identified and have been added to the **Catalog of Specifications (D3.1)**. In general, we can confirm that the Building Blocks identified are indeed the most important ones being used in cities.

There are some clear overlaps in terms of requirements of the local authorities, but there are many different technologies being used to underpin them. In this section, we will go through some of the most relevant overlaps. We can identify three large categories of technologies that are often referred to: Geographic tools, 3D city models and data management tools. Within each of these categories there are many alternative technical implementations. For more information on each of these please refer to the Catalog of Specifications.

### Geographic Tools

The GIS and geographic tooling is the most pervasive technology that is being used in all of the discussed use cases. However, there are many different ways this is implemented:



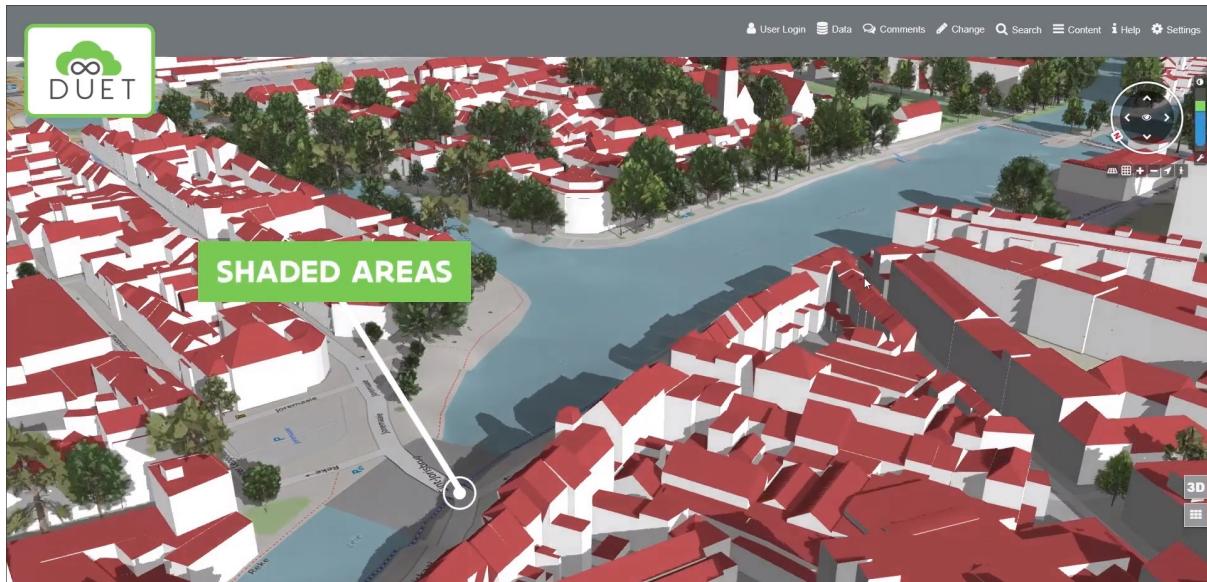
- Esri ArcGIS: ArcGIS is a comprehensive suite of GIS software developed by Esri. It provides a wide range of tools for data management, spatial analysis, mapping, and visualisation. Most cities and communities use ArcGIS for their GIS infrastructure and spatial data management.
- Open-source GIS: Open-source GIS technologies like QGIS (Quantum GIS) and GRASS GIS are popular choices for cities due to their flexibility, cost-effectiveness, and active user communities. These platforms offer similar functionalities to proprietary GIS software and can be customised to meet specific city requirements.
- Web-based GIS: Web-based GIS platforms allow cities to share geospatial data and applications with the public and internal stakeholders through the internet. Examples include ArcGIS Online, Mapbox, and Google Maps API. These platforms enable interactive mapping, data visualisation, and analysis accessible through web browsers.
- Remote Sensing: Cities utilise remote sensing technologies such as satellite imagery, aerial photography, and LiDAR (Light Detection and Ranging) data to gather detailed spatial information. Remote sensing data is used for urban planning, land use management, environmental monitoring, and disaster response.
- GPS and GNSS: Global Positioning System (GPS) and Global Navigation Satellite System (GNSS) technologies are crucial for data collection and asset tracking in cities. GPS/GNSS receivers are used to capture accurate geographic coordinates of points, lines, and polygons, supporting field data collection and navigation. The dominance of GPS over Galileo SAR services in software remains a fact, as none of the use cases analysed is using the latter.

### 3D Modelling Tools

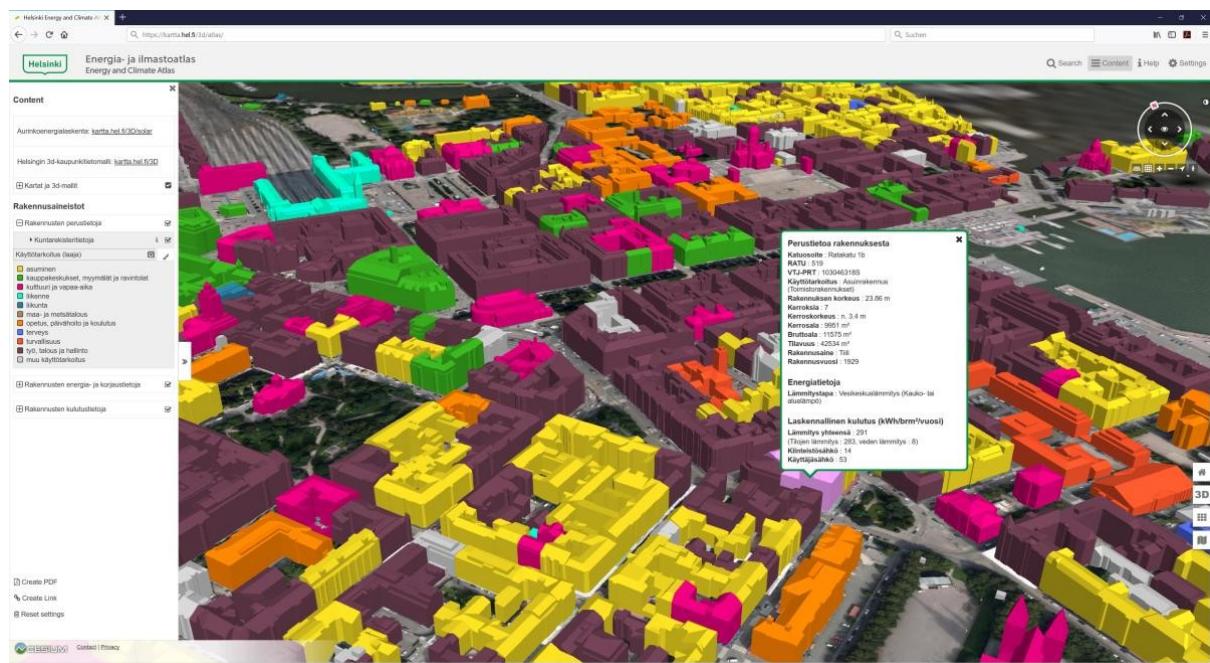
Local Digital Twins provide a new way to underpin city management. Some cities are already experimenting with these technologies, which often includes a 3D visualisation of the city. To present 3D models of cities, several technologies and formats are utilised.



For instance:



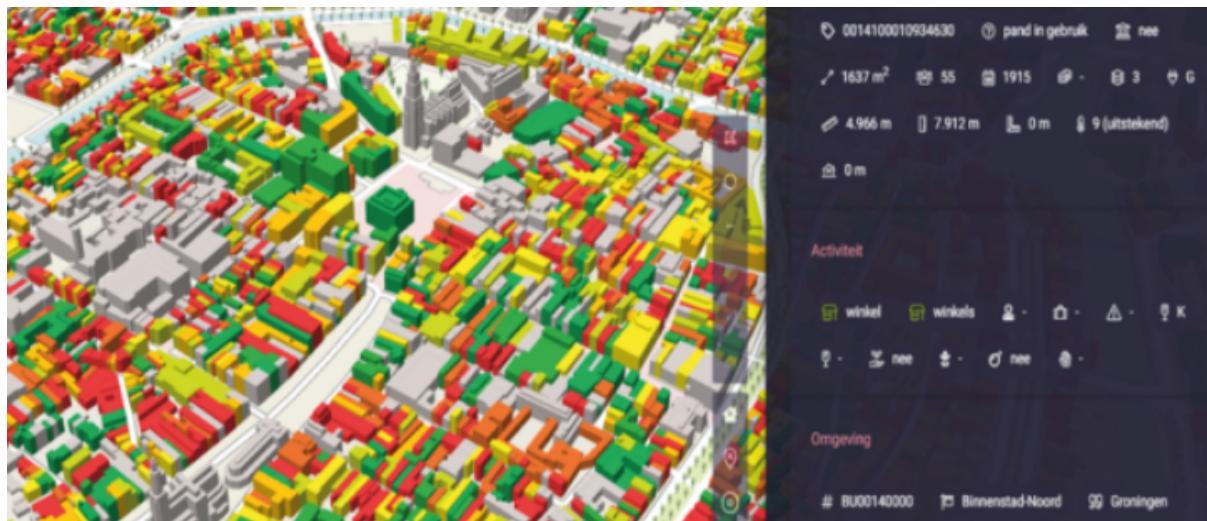
The [DUET project](#) created Digital Twins in Ghent, Belgium and Pilsen Czechia, mainly focussing (but not limited to) mobility challenges



The [Helsinki Climate Atlas](#) focuses on energy use and Climate Impact.



The City of Rotterdam is investing heavily in a [cross-domain digital twin](#), which will be deeply embedded in the City's ICT architecture



Argaleo, a company based in 's-Hertogenbosch, the Netherlands, is creating [Local Digital Twin solutions](#) for many domains, including urban planning, mobility, security, and more

Each of these solutions will, in some way or another, include a visual 3D representation of the city.



We identified 2 commonly used technologies for visualising 3D city models within the use cases that were researched:

- CityGML: CityGML is an open data model and XML-based format specifically designed for representing and exchanging 3D city models. It provides a standardised way to describe the geometry, semantics, and appearance of urban features such as buildings, roads, terrain, vegetation, and more. CityGML enables the creation of detailed, multi-scale 3D models of cities and supports interoperability between different software applications.
- glTF (GL Transmission Format): glTF is an open standard file format designed for efficient transmission and loading of 3D models in real-time applications. It is specifically optimised for web and mobile platforms and provides support for geometry, materials, textures, animations, and other visual attributes. glTF is widely used for presenting 3D city models on the web and in augmented reality (AR) and virtual reality (VR) applications.

These technologies can be used in conjunction with other tools and software to create interactive and immersive experiences of 3D city models. Here are a few additional technologies and techniques commonly used for presenting 3D city models:

- 3D Modelling Software: Software applications like SketchUp, Autodesk 3ds Max, Blender, and Trimble CityEngine are commonly used for creating and editing 3D models of cities. These tools provide a range of modelling and texturing capabilities to build detailed representations of urban environments.
- Visualisation Engines: Game engines and visualisation platforms such as Unity, Unreal Engine, and CesiumJS are used to render and display 3D city models. These engines provide real-time rendering, lighting, and interactive capabilities, allowing users to explore and interact with the virtual city models.
- Virtual Reality (VR) and Augmented Reality (AR): VR and AR technologies enhance the visualisation of 3D city models by providing immersive experiences. Virtual reality headsets like Oculus Rift, HTC Vive, or AR-enabled devices like smartphones and tablets enable users to view and



navigate through realistic virtual city environments. An example of how VR can be employed by cities can be found in [UDI's Digital City Program](#)

- Web-based Platforms: Web-based platforms like CesiumJS, Three.js, and Babylon.js provide frameworks and APIs for rendering and interacting with 3D city models directly in web browsers. These platforms leverage WebGL and other web technologies to deliver 3D visualisation and interactivity without the need for additional plugins or software installations.
- Point Cloud Data: 3D laser scanning or LiDAR technology is used to capture large-scale point cloud data of cities. Point clouds represent the surface of buildings and other urban objects with dense sets of 3D coordinates. Software applications like Autodesk ReCap, Bentley Pointools, and CloudCompare are used to process and visualise point cloud data, enabling realistic representations of cities.

These technologies, including CityGML and glTF, offer various options for presenting and interacting with 3D models of cities, enabling urban planners, architects, and the general public to explore and analyse urban environments in a visually immersive manner.

## Sensor Data Management

A common need found within those cases working with real-time and/or sensor data is the collection, distribution and contextualisation of this data. For this purpose, a “context broker” can be used, such as the Orion Context Broker<sup>15</sup>, or alternatively, a “message queue” with publish-subscribe functionalities. Furthermore, standards and specifications are required for the transmission and publication of sensor data (streams). Some examples:

- LDES (Linked Data Event Streams): LDES is a W3C specification that enables the publication, distribution, and consumption of linked data streams. It provides a standardised way to represent and transmit real-time event data as linked data. LDES leverages existing web technologies such as HTTP, JSON-LD, and Linked Data Platform (LDP) to facilitate the exchange of

<sup>15</sup> <https://github.com/FIWARE/context.Orion-LD>



sensor data.

- NGSI-LD (Next Generation Service Interface for Linked Data): NGSI-LD is an open standard developed by ETSI (European Telecommunications Standards Institute) for managing and exchanging data in a context-aware system. It is particularly well-suited for the Internet of Things (IoT) and smart city applications. NGSI-LD allows for the representation of sensor data as linked data, providing a standardised format for describing entities, attributes, and relationships in a semantically meaningful way.
- MQTT (Message Queuing Telemetry Transport): MQTT is a lightweight publish-subscribe messaging protocol that is widely used for IoT applications. It enables efficient and reliable communication between sensors and the applications that consume their data. MQTT supports a publish-subscribe model where sensors publish data to a broker, and subscribers receive the data by subscribing to specific topics.
- Apache Kafka: Apache Kafka is a distributed streaming platform that is often used for real-time data processing and event streaming. It provides a highly scalable and fault-tolerant infrastructure for handling large volumes of data. Kafka allows for the efficient ingestion, storage, and distribution of sensor data, making it suitable for scenarios where high throughput and low latency are required.
- AMQP (Advanced Message Queuing Protocol): AMQP is an open standard messaging protocol that supports reliable and interoperable messaging between applications and systems. It provides features such as message queuing, routing, and security. AMQP can be used to distribute sensor data in a decoupled and scalable manner, enabling efficient communication between sensors and data consumers.
- CoAP (Constrained Application Protocol): CoAP is a lightweight protocol designed for resource-constrained devices and networks, such as those found in IoT deployments. It follows a client-server model and supports request-response interactions. CoAP can be used to distribute sensor data over constrained networks, providing a scalable and energy-efficient solution.
- RESTful APIs (Representational State Transfer): RESTful APIs are a common approach for distributing data over the web. They use standard HTTP



methods such as GET, POST, PUT, and DELETE to interact with resources. RESTful APIs can be utilized to expose sensor data as web services, allowing data consumers to retrieve and manipulate sensor information using standard HTTP protocols.

### 3.3 Common challenges

Setting up a data space in cities and communities can be a daunting task. Partly due to the diversity of data that is relevant within cities and communities, as has been shown in section 2.3: Workshop Results, but also due to a number of legal and practical constraints. Through the evaluation of the use cases, we were able to identify some recurring issues:

- **Procurement**

European and member state procurement laws and regulations are designed to allow a free market and to make sure that any provider with a qualitative product may have access to government funds<sup>16</sup>. However, specifically in an ICT context, this often leads to a fragmented ICT landscape within local and regional governments. At any point in time, when a tender is sent out, different providers may change their pricing strategy in order to gain the contract, forcing the procurer to integrate new software. This leads to large integration costs, and an ever evolving ICT landscape. Therefore, ICT solution vendors will naturally try to “lock-in” customers by differentiating their solution based on the way they handle data, or specific processes or domains they support. It is not rare within ICT procurement for the argument of “sole supplier” to be used.

Nevertheless, both solution providers and procurers agree that standardisation may help to reduce integration costs and level the playing field for solution providers. Many initiatives in this sense have already been launched and implemented, of which *Interoperable Europe* and the introduction of the *Minimum Interoperability Mechanisms* are some of the most obvious. These initiatives often identify the need to enforce interoperability through the use of procurement clauses.

<sup>16</sup> EU initiative *Big Buyers Working Together*:

<https://public-buyers-community.ec.europa.eu/about/big-buyers-working-together>



## Procurement clauses:

- [Sharing and Re-use Standard clauses](#) by the Open Source Observation (OSOR)

This is a set of standard procurement clauses which can be used when procuring reusable software. These clauses have been produced in the scope of ISA Action 4.2.5. “Sharing and re-use Strategy”. The aim of this ISA action is to develop a holistic approach to sharing and reuse across border and sectors with a view to helping public administrations all over Europe to share and reuse solutions related to public services delivery in an efficient and effective way.

- Amsterdam's procurement clauses for AI: [Standard Clauses For Procurement Of Trustworthy Algorithmic Systems](#)

These are “standard” clauses that can be applied when procuring AI tools. There is a wide ranging discussion on how and when AI can be used in an ethical way in general, but also specifically within governments. There are a number of initiatives tackling this, such as [Living-in.eu](#)'s work on MIM5, championed by the city of Amsterdam. One of Amsterdam's solutions in this field is the creation of these clauses, which focus on transparency and explainability.

- The Flemish [Sample Clauses for Open Data](#), and their Standards Registry.

A recurring issue is that ICT vendors keep data locked in their systems. This can be a practical or a strategic decision on their part, but in any case, procurers should be aware that if they require continuous access to the data underpinning solutions, this needs to be made explicit in procurement contracts. This is especially (but not only) the case when the data should be published as open data. It is for this reason that the Flemish regional government has produced these standard clauses for open data to be used in procurements in Flanders.

- **Data quality**

The lack of high-quality data was mentioned by most of our interviewees. For instance, in the case of the Helsinki Energy Atlas machine-readable data was not available at first and had to be created manually in a pre-step. Furthermore, various significant variables were not available. The quality of existing data was too poor to show the renovation history of the buildings. For the IDEA project in Amsterdam, the



issue of data quality of reported road and bridge closures and hence trusting its sources was the reason to kick off the project overall.

- **Level of granularity**

Often the rather coarse level of granularity of existing datasets led to limitations and challenges when developing use cases. For instance with the Helsinki Energy Atlas, the coarse level of district heating leads to data averaging, which can result in biased outcomes. Furthermore, energy data was available aggregated per building due to GDPR constraints (as mentioned below).

- **Limitations / Challenges for data sharing**

Accessibility and sharing of data has been found to be highly challenging. For instance, in the case of accessing energy data (Helsinki Energy Atlas): Even though the owner of the energy data was the city-owned energy company, it was difficult for project stakeholders to gain access to it to develop the Energy Atlas.

- **GDPR and legal based challenges**

GDPR regulations, especially when including energy data as for instance in the case of Helsinki Energy Atlas, lead to challenges: data was available aggregated per building and only with owners' permits.

### 3.4 Minimum Interoperability Mechanisms in DS4SSCC use cases

Minimum interoperability mechanisms (MIMs) can facilitate the creation of data spaces because they define the mechanisms through which minimal interoperability can be achieved across local authorities, with sometimes far different ICT architectures. Through the evaluation of the use cases, we have been able to identify some concrete mechanisms already in place. This section details these mechanisms for the most relevant MIMs for data spaces for cities and communities, namely MIM1 and MIM2.

Recently, the MIM specification ([version 5.5](#)) has undergone some changes to reflect the new “y.MIM” standard which specifies the substituting components of each of the MIMs. These components can summarily be described as:

- **Objective:** the interoperability issue(s) this MIM is trying to solve, going from providing context information in IoT settings to authentication of users.
- **Capabilities:** the intended capabilities of any solution which adheres to the MIMs specification.



- **Requirements:** a more detailed description of how these capabilities can be realised technically.
- **Mechanism:** a description of the different mechanisms which fulfil these requirements.
- **Specifications:** an overview of the specifications used within each of these mechanisms
- **Interoperability guidance:** a number of solutions to allow interoperability between different mechanisms adhering to the same MIM
- **Conformance and compliance testing:** A description of how adherence to the MIM specification can be achieved.

The [y.MIM specification](#) is currently undergoing a standardisation track within the ITU.

### 3.4.1 Relevant MIMs for the Use Cases

Each of the selected use cases pertains to multiple MIMs, as indicated in section 2.2: Workshop results. In this section however, we discuss the most relevant MIM that impacts each of them. This allows us to draw some conclusions about which mechanisms are being used in real-world settings implementing these MIMs. This will in turn feed back into the further development of the MIMs. The table below gives an overview of which MIM has been identified to be most paramount for each of the use cases.

Flemish Smart Data Space (Flanders)	MIM1: Context MIM2: Data Models
Climate Atlas (Helsinki)	MIM2: Data Models MIM7: Places MIM8: Indicators MIM9: Analytics
Intelligent Data Exchange Alliance (Amsterdam)	MIM1: Context MIM2: Data Models MIM7: Places MIM8: Indicators
Urban Development Initiative (Eindhoven and Helmond)	MIM1: Context MIM2: Data Models MIM7: Places MIM8: Indicators



Score Water (Barcelona, Amersfoort, Göteborg)	MIM1: Context MIM2: Data Models
Farm2Fork (Kranj)	MIM3: Contracts MIM4: Trust

By far the most common MIMs in this overview are MIM1 and MIM2. We therefore focus on each of these and define the specific mechanisms used in those use cases to realise them.

## MIM1

Of special interest to the creation of local data spaces is how context information is exchanged between different IoT infrastructures. We identify two different mechanisms among the use cases that are both very different, but essentially attempt to enable the same capabilities. Therefore it is logical that they should somehow allow “minimum interoperability”. We will drill down on how this can be achieved, first, by examining, in detail, how each approach (or “mechanism”) fulfils MIM1’s requirements, and how these differences can be addressed in order to establish a data space between them. This is important because a local data space will always consist of different actors (data providers) which may very well be operating very different systems, especially

- **Flemish Data Space**

The Flemish Smart Data Space (VSDS) aims to support multiple data space initiatives within Flanders, by providing a number of technical building blocks, convening partners, using a similar and well-documented approach. We will use this use case to gain more insight in MIM1:

MIM1 Requirements	MIM1 Mechanisms
<b>R1:</b> A uniform interface should be used; the context management API	The Smart Data Space has multiple pilots running right now, but uses a common architecture for all of them. This architecture is based on providing Linked Data Event Stream (LDES) for each of the data providers, within and across domains, thus realising a common uniform interface. Event streams cannot be strictly defined as an “API” but do provide all the required



MIM1 Requirements	MIM1 Mechanisms
	functionalities to be considered as one in this context as R1 only refers to “read” methods.
<b>R2:</b> Information from all sources should use the same concepts, so called data information models	An event stream typically records occurrences related to a specific sensor, which can be related to any semantic concept or “Class”. The Flemish government has put a lot of effort in co-creating the OSLO vocabularies, and aims to mainly use these as information models for any stream within the VSDS. OSLO vocabularies are based on the ISA <sup>2</sup> Core Vocabularies, and are carefully constructed to always refer to the most prevalent ontologies within the domain. There is no restriction however to point to information models available outside of the Flemish context, and indeed, sometimes <a href="#">Smart Data Models</a> are referenced.
<b>R3:</b> The uniform interface should support retrieval of latest data	The VSDS architecture is based on streams that are paginated. This means that any data consumer will have to “follow” the stream to the last entry in order to find the most actual occurrence or measurement. This process can be sped up by providing a pointer to the last “page” in the stream description.
<b>R4:</b> The uniform interface should support retrieval of historical data	This requirement is where event streams really excel. They inherently record occurrences over time without dropping or archiving any of the previous ones.
<b>R5:</b> The uniform interface should support geospatial querying	Event streams can be organised to be subsequent not in terms of “time” but in terms of geometry as well. There is an LDES server implementation which allows the publication of streams organised geographically, using the concept of “slippy maps”. However, as this is not the primary goal of the VSDS they are currently not implementing this.



MIM1 Requirements	MIM1 Mechanisms
	In order to query geographically over a time-based LDES event stream, the client will need to populate a database (which can be either a triple store or a geographic database such as PostGIS) with the events it wishes to query and apply a GeoSPARQL or other geospatial query.
<b>R6:</b> The uniform interface should support subscription to changes	This can be achieved through a simple polling mechanism. The last “page” of an event stream gets populated with new occurrences until the “pagelimit” is reached. When this occurs, the HTTP Cache-Header: is set to “immutable”, which implies the next page is available. The link to this page can be found in the stream.
<b>R7:</b> Relevant data sources to any required context (at least location and time period) should be discoverable and retrievable according to their context	Currently, the VSDS is not keeping an index of different contexts. It simply lists the different data producers (sensors or otherwise) as individual streams. In order to allow the retrieval of a data source specific to a context, the client should evaluate each of these streams client-side.  In order to truly allow programmatic discovery of new data sources related to any context, this list should be structured as an index, through a broker or otherwise through a data catalogue (such as DCAT)
<b>R8:</b> Specific subsets of data relevant to the context should be retrievable from within larger data sets and with default limits and page sizes	This requirement is inherently fulfilled due to the pagination-based approach of Linked Data Event Streams.

- SCORE Water

MIM1 Requirements	MIM1 Mechanisms
<b>R1:</b> A uniform interface should be used; the context management API	The SCORE Water project uses the Orion Context Broker to publish most of its



MIM1 Requirements	MIM1 Mechanisms
	sensor readings. Thus, this requirement is satisfied by using the NGSI-LD API.
<b>R2:</b> Information from all sources should use the same concepts, so called data information models	This is provided through the common NGSI-LD information model, which is the meta model on which the API is based. The (NGSI-LD) world consists of Entities that can have Properties, Relationships etc.
<b>R3:</b> The uniform interface should support retrieval of latest data	THE NGSI-LD specification supports retrieval of the latest data by simply querying the pertaining entity using a HTTP GET call (GET /ngsi-ld/v1/entities/<entity>)
<b>R4:</b> The uniform interface should support retrieval of historical data	NGSI-LD supports the querying of historic data, provided it is being stored on the server. To this end, again, a simple GET request can be sent to the entity being observed, and a parameter ("LastN") can be set to list the latest N observations.
<b>R5:</b> The uniform interface should support geospatial querying	The NGSI-LD specification allows geospatial querying by providing the "georel" attribute, which can restrict results to a geographic area.
<b>R6:</b> The uniform interface should support subscription to changes	It is possible to subscribe to changes on an NGSI-LD compatible context broker, simply by "POSTing" a subscription object. This object can specify exactly when the client will be notified and extensive filtering is available. In each subscription object and endpoint should be specified, which will receive a POST request from the broker, as soon as the requirements for notification are met.
<b>R7:</b> Relevant data sources to any required context (at least location and time period) should be discoverable and retrievable according to their context	A context broker supporting NGSI-LD will maintain a list of entities. These can be retrieved based on their types and attributes, such as their geographic location.
<b>R8:</b> Specific subsets of data relevant to the context should be retrievable from within larger data sets and with default limits and page sizes	NGSI-LD in itself is agnostic to pagination.



## MIM2

The objective of MIM2 is to support cities and communities to use consistent and machine-readable definitions of all the entities about which data is being captured in a data ecosystem, so that data about any entity can be combined with other data referring to that entity in the confidence that they refer to the same thing.

We will compare how each of the use cases under scrutiny realise this objective. Because each of the use cases use a plethora of different data models, an exhaustive analysis of each of these would take us too far. Instead, this analysis focuses on the most relevant dataset in each of the three cases and summarises how these do or do not fulfil the requirements of MIM2

- Helsinki Energy & Climate Atlas

In section 2.2, the main datasets (and therefore their models) have been identified for each of the use cases. For the Helsinki Energy & Climate Atlas, these are:

- 3D City Model (CityGML)
- Building registry (heating mode, building materials, contained square metres, number of building stories)
- Energy data (district heating, electricity, water consumption, energy efficiency level)

CityGML is a pervasive standard in many Local Digital Twin projects. Whereas building and energy data often differs more based on local utility providers and contexts, we will currently focus on CityGML.

MIM2 Requirements	MIM2 Mechanism
<b>R1.</b> As far as possible, data models should be taken from a list of standard specifications. Use common concepts and vocabularies.	In the case of CityGML this is obviously the case. CityGML is one of the most prevalent standards to be used when visualising cities and is well <a href="#">defined by the OGC</a> .
<b>R2.</b> All key entities in any data set should be formally defined in a machine-readable way.	CityGML is serialised as XML and thus fulfils this requirement.
<b>R3.</b> Data models should contain as much information as possible regarding their context	CityGML, as opposed to other 3D modelling standards such as KML, offers a



	rich set of semantic properties related to urban context.
<b>R4:</b> Data models should be in a format consistent with MIM1	Each feature within CityGML can optionally contain a bitemporal timestamp, which makes it easy to model changes over time. It is inherently geographic in nature so it also allows geographic positioning. The standard includes a “Dynamizer” module, which makes it easy to connect to IoT components, particularly to those within the OGC family (supporting SOSA/SSN, the SensorThings API, etc)
<b>R5:</b> Data models should be clearly defined using a consistent process to enable ease of transformation between the different sets of standard data models	CityGML is governed as an open standard by the OGC and is extensively documented, and so are its different versions. Transitioning between version is possible, and links with other data models are maximally made where relevant (for instance, to the ISO 191xx family)
<b>R6:</b> Translation engines should be developed/identified to enable data models from different standards to be aligned	This is clearly the case within the Helsinki Energy and Climate Atlas, since different datasets pertaining to energy have been aligned with the CityGML features. The features themselves have been enriched by importing properties from City-governed datasets which detail building materials etc...

- **Amsterdam Intelligent Data Exchange Alliance (IDEA)**

In section 2.2, the main datasets (and therefore their models) have been identified for each of the use cases. For the Amsterdam Intelligent Data Exchange Alliance, these are:

- BeMobile Floating Car data,
- Amsterdam / The Hague City CouncilPlanning data (Official data on road construction and bridge closure),
- Rijkswaterstaat (National Road Authority) road work datasets
- Waze Trusted Messages



The most interesting data model to zoom in on in this case is DATEX II. Datex II is a standard that is very actively used with the ITS ecosystem and has especially gained traction with the introduction of NAPCORE, which aims to harmonise mobility platforms across Europe.

MIM2 Requirements	MIM2 Mechanism
<b>R1.</b> As far as possible, data models should be taken from a list of standard specifications. Use common concepts and vocabularies.	DATEX II is a well known standard, governed by the CEN Technical Committee 278 and widely used throughout Europe by traffic and mobility operators.
<b>R2.</b> All key entities in any data set should be formally defined in a machine-readable way.	DATEX II is originally based on XML but can also be serialised as JSON.
<b>R3.</b> Data models should contain as much information as possible regarding their context	DATEX II is a large multi-part standard containing lots of semantic information about many different traffic and mobility phenomena. Furthermore, multiple efforts have been made to either map the standard to a fully linked data version, or to include linked data references within the existing specification.
<b>R4:</b> Data models should be in a format consistent with MIM1	Datex II supports both time-based and location-based reference of measurements, for instance within the “MeasuredData” class, and can this be applied within an IoT setting.
<b>R5:</b> Data models should be clearly defined using a consistent process to enable ease of transformation between the different sets of standard data models	The governance of DATEX II is being carried out within CEN, and therefore is well defined, and versioning is well supported.
<b>R6:</b> Translation engines should be developed/identified to enable data models from different standards to be aligned	As to be expected in a rather mature domain such as mobility, many alignment initiatives have been undertaken to align DATEXII with various other data models and standards (notably TMC: Traffic Message Channel or SIRI: Service interface for real-time information relating to public transport operations)



## 4 DS4SSCC Data Cooperation Canvas: the Use Cases perspective

As introduced in section 1.1, the DS4SSCC blueprint defines the guidelines and mechanisms required for the upcoming deployment of the data space. The blueprint is being defined by different pieces across several work packages in the project (WP2, WP3, WP4). In order to align and consolidate all these pieces in a common tool for the data space creators, an instrument called **Data Cooperation Canvas** has been conceived by the WP2 to support them, in collaboration with WP3 and WP4, detailed in deliverable D2.2: Multi-stakeholder governance scheme. The WP2 is more focused on filling the Canvas regarding the Governance and Business Models, while WP3 and WP4 are filling the Technical aspects, which included the Data & Data Sources (mostly coming from the provided input by the use cases about their datasets), Interoperability (which mechanisms they are using or plan to use), Technical Concepts/models and Technical infrastructure, both more on the side of WP3.

. Below is a summary of the aspects to take into account in the Canvas. Each component of the canvas is further elaborated below the overview.

Data & Data Sources	
Supply Side	Demand Side
<ul style="list-style-type: none"><li>• Provide metadata</li><li>• Document access type (API)</li><li>• Detail data quality attributes</li><li>• Detail SLA levels</li><li>• Provide contact details</li></ul>	<ul style="list-style-type: none"><li>• Find potential data source</li><li>• Access third party API</li><li>• Assess data quality attributes</li><li>• Decide required SLA specs</li><li>• Negotiate or define smart contracts</li></ul>
Interoperability	
Supply Side	Demand Side
<ul style="list-style-type: none"><li>• Analyse state of the art in terms of semantics (<a href="#">LOV</a>, <a href="#">Smart Data Models</a>, ...)</li><li>• Apply the most common</li></ul>	<ul style="list-style-type: none"><li>• Assess if the semantics of the data are properly understood</li><li>• Assess if the provided data models and ontologies can</li></ul>



ontologies for the data domain <ul style="list-style-type: none"><li>● Decide on applicable / feasible level of verbosity</li><li>● Provide links to other relevant ontologies</li></ul>	sufficiently be mapped to the (internal) target system <ul style="list-style-type: none"><li>● Where necessary, identify the required MIM2 PPI's (Pivotal Points of Interoperability, for instance, GeoJSON) and interoperability mechanisms (wrappers, mappers, convertors)</li></ul>
Technical Concepts / Models	Technical Infrastructure
<ul style="list-style-type: none"><li>● Decide on trust levels and set up Trusted Exchange / Marketplace model accordingly</li><li>● Decide on necessary Usage Control systems</li><li>● Select an Identity Provider</li><li>● Set up metering</li></ul>	<ul style="list-style-type: none"><li>● Define scalability requirements</li><li>● Define durability requirements</li></ul> <p><i>For cloud-based infrastructures:</i></p> <ul style="list-style-type: none"><li>● Define data transferability requirements</li><li>● Check GDPR compatibility</li><li>● Check pricing structure</li></ul>

## Data and Data Sources

In setting up a local data space, the first question one should ask is: What data is required to operationalise it? What are the data sources used? Who manages the data and how is it governed? This may differ depending on the local context and governmental setting. National regulations may have far reaching impacts on how data spaces can be organised, but also sector-specific regulations may be in place. As such, many cases local authorities will depend on regional or national governments for a number of data sources, but they will certainly also need to manage some datasets themselves. Moreover, most certainly, authorities will need to depend on 3rd parties such as utility companies and private companies to complete the landscape. Once this landscape is plotted, several steps will need to be taken both on the supply and the demand side:

- **Supply side:**
  - Provide metadata
  - Document access type (API)
  - Detail data quality attributes
  - Detail SLA levels
  - Provide contact details



- **Demand side:**
  - Find potential data source
  - Access third party API
  - Assess data quality attributes
  - Decide required SLA specs
  - Negotiate or define smart contracts

## Semantics and Definitions

- **Supply side:**
  - Analyse state of the art in terms of semantics (LOV, Smart Data Models, ...)
  - Apply the most common ontologies for the data domain
  - Decide on applicable / feasible level of verbosity
  - Provide links to other relevant ontologies
- **Demand side:**
  - Assess if the semantics of the data are properly understood
  - Assess if the provided data models and ontologies can sufficiently be mapped to the (internal) target system
  - Where necessary, identify the required MIM2 PPI's and interoperability mechanisms (wrappers, mappers, convertors)

## Technical Concepts / Models

- Decide on trust levels and set up Trusted Exchange / Marketplace model accordingly
- Decide on necessary Usage Control systems
- Select an Identity Provider
- Set up metering

## Technical Infrastructure

- Define scalability requirements
- Define durability requirements



*For cloud-based infrastructures:*

- Define data transferability requirements
- Check GDPR compatibility
- Check pricing structure

Some of the use cases will be selected to fill their Data Cooperation Canvas. They will provide them an holistic overview of what to address in all aspects to set up the data space. This tool can be complemented with the CookBook to be provided in D3.2 with the particular recipes for these use cases to follow on technical deployment.

### 4.3 Design Architecture & Implementation

The final step in realising the local data space is to design the architecture, implement the required systems and organise the operational side by setting up contracts, SLA's, organisational changes, etc. These are extensive operations and require careful planning, execution and continuous evaluation.

This task is further detailed in WP3, more specifically in D3.2: Technical Architecture.

## 5 Conclusions and next steps

### 5.1 Conclusions

In this deliverable, we presented the outcome of our in-depth study on priority datasets and related use cases. Based on a large selection of use cases relevant to the DS4SSCC, we prioritised and shortlisted finally a set of 7 use cases we then further conducted interviews on, exploring overlaps in technological approaches and datasets that have been used. Results have shown that while most datasets are relatable to datasets and domains as defined by the European Commission, there are existing gaps for both public (as covered by the EC) and private sector (as covered in upcoming Data Act<sup>17</sup>) data in the current official dataset environment that need to be taken into account.

The in-depth analysis of these different use cases has contributed further to a thorough understanding of the real-world ICT architectures being used in different City or Community settings. Outcome shows that there are clear overlaps in terms

<sup>17</sup> Data Act: [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_22\\_1113](https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1113)



of requirements of the local authorities, but there are many different technologies being used to underpin them that have been presented in this work.

Together with results of work conducted in other WPs (D2.2,D3.1, D3.2), these results will lead to the development of a blueprint and Data Cooperation Canvas as outlined in this deliverable, supporting stakeholders setting up a dataspace for smart and sustainable cities and communities.

## 5.2 Next Steps

Findings of this deliverable will support WP3 to customise the high level reference architecture to some representative use cases of data spaces (D3.2). These use cases will be the perfect validation framework for the proposed architecture and recipes (CookBook). Therefore we will select and invite at least three of our use cases for further elaboration. Based on our findings, Minimum Interoperability Mechanisms (MIMs) will be updated and an action plan developed. The developed blueprint will be then taken into action by the application to pilot projects that will be gathered in an open call process as part of DS4SSCC-Deployment project.

## Our consortium



Gospodarska  
zbornica  
Slovenije  
Chamber of Commerce  
and Industry of Slovenia



## 6 Annexes

### ○ 6.1 Annex 1: Use Case list

Strategic Field of Data Spaces	Use Case	Related Project	geographic Scale	# of MIMs	MIMs	Tech	# of Techs	Total
Energy	Web based information platform for energy management: The platform is a cloud -based service which collects data from the buildings and the District Heating (DH) substations. The data is then used for governing the space heating demand-supply in a more efficient way, and to visualize the buildings energy performance.	Ruggedised	Umea, SWE (building level)	3	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM9 – Analytics ;	9	4	16
Public administration	Sensors to measure filling of waste containers implemented	Ruggedised	Rotterdam, NL	2	OASC MIM1 – Context ; OASC MIM2 – Data Modules;	8	3	13
Health	Noise and air pollution monitoring for more efficient mobility and healthy cities	GreenMov	Region Murcia, ESP ; Nice, FRA	3	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places;	8	4	15
Urban Planning	Developing a Digital Twin to simulate urban (re-)development projects	Slim Ruimtelijk Plannen	Ghent	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM5 – Transparency ; OASC MIM7 – Places;	7	2	13
Mobility	Intermodality between bikes and trains: bikes availability at train stations spots	GreenMov	Flanders	4	OASC MIM1 – Context ; OASC MIM3 – Contracts; OASC MIM4 – Trust OASC MIM7 – Places;	9	3	16
Public administration	Keep sidewalks bin-free: The objective of the challenge was to predict waste collection time thanks to AI, and alert building caretakers via text messaging of exact collection times in order to reduce the occupation of public areas.	Data City Lab	Paris, FRA	3	OASC MIM2 – Data Modules; OASC MIM5 – Transparency ; OASC MIM4 – Trust ;	7	3	13



Urban Planning	Driving urban planning through citizen's voice: The solution consists of an interface that enables the user to monitor opinions expressed by citizens on all feedback channels, including social networks (Facebook, Twitter), DansMaRue and other sources. The main dashboard presents the aggregated citizens' opinion expressed on sourced networks, classified into categories of urban management (such as security, education, public spaces, environment etc.) and specifying if this opinion is positive, neutral or negative. In addition, any user can drill down to actual trends and keywords people use and create alerts on specific categories and/or topics.	Data City Lab	Paris, FRA	6	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM3 – Contracts; OASC MIM4 – Trust ; OASC MIM5 – Transparency ; OASC MIM7 – Places;	7	3	16
Tourism	Analysing travel patterns on tourist buses: The objective of the challenge was to help RATP Dev, operator of transportation systems, to understand customers' usage of its bus fleets by analysing specific bus routes and ticket sales to optimise the routes of the Open Tour travelling throughout Paris.	Data City Lab	Paris, FRA	5	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM3 – Contracts; OASC MIM5 – Transparency ; OASC MIM7 – Places;	8	2	15
Energy	Renewable energy on a district scale	Data City Lab	Paris, FRA	3	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM9 – Analytics ;	7	3	13
Green Deal	GoalGreen App	Replicate	Florence, IT	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	9	3	16
Mobility	Lisbon: micro mobility, road management		Lisbon, POR	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	9	4	17



Cross	Barcelona: Digital Democracy and Data Commons.; Citizen Science Data Governance (noise level, pollution) Amsterdam: Amsterdam Digital Register	DECODE	Barcelona, ESP ; Amsterdam, NED	3	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM4 – Trust	7	5	15
Mobility	MaaS Madrid		Madrid, ESP	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	9	3	16
Mobility	Vlaanderen	KLIP	Flanders	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust			4
Public administration	Thames Valley Berkshire Live Lab - Road maintainance: GPC will use a combination of anonymised crowd movement data from O2 Motion, road usage information from Siemens, and analysis from 3D cameras mounted on bin lorries to map the most heavily used local routes with the worst road surface quality. This will help local authorities prioritise improvements such as fixing potholes.	Thames Valley Berkshire Live Lab	Reading, UK	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM4 – Trust; OASC MIM5 – Transparency	6	3	13
Mobility	Lisbon / Vodafone		Lisbon, Por	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	8	2	14
Mobility	Ghent	TMaaS	Ghent, BEL	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	9	3	16



Health	Thames Valley Berkshire Live Lab - Air Quality: We've introduced software company GPC Systems to combine anonymised, aggregated O2 Motion movement data with findings from Siemens air quality monitors to measure air quality and public exposure to harmful pollutants. This provides valuable insight into how many people are affected, for how long, and on what types of journeys. The project will then look at encouraging healthier and more sustainable ways of getting around	Thames Valley Berkshire Live Lab	Reading, UK	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	7	3	14
Mobility	Flanders Smart Data Space Data Integration for Smart Mobility Flanders Water Dataspace	DCAT AP-VL	Flanders	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	9	4	17
Green Deal	SUPERvisory control system for plant-wide OPTImization of wastewater treatment plant operation - SUPEROPTI		Slovenia	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM3 – Contracts; OASC MIM7 – Places;	9	3	16
Energy	Optimization based control of P2G converter connected to hydro power plant		Slovenia	3	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM3 – Contracts;	8	2	13
Environment	Pamenti waterworks to monitor water consumption in real time, monitoring garbage production in real time			3	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM3 – Contracts;	8	2	13



Environment	The Smarter AoE project focuses on the Amazon of Europe (AoE) area around the Mura-Drava-Danube biosphere reserve, and extends through Austria, Slovenia, Croatia, Hungary and Serbia. The main goal of the project is to establish an international ecosystem of tourism SMEs in the area (and the pilot areas in Montenegro, Bulgaria, and Romania). It aims to boost social, digital and innovation through collaboration, capacity-building and digital transformation.		AUT, SLO, CRO, HUN, SER, MON, BUL, ROM	4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM3 – Contracts; OASC MIM7 – Places	7	3	14
Environment	Waste management and waste prevention program:  The main objective of the project is to implement a comprehensive set of complementary technical, digital, environmental, social, and circular solutions to realize the full potential of the program, achieve maximum material self-sufficiency, and increase the circular return in the waste and resource sector.	LIFE program		4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM3 – Contracts; OASC MIM7 – Places	7	3	14
Mobility	myAthensPass - parking app			4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM7 – Places; OASC MIM4 – Trust	9	3	16
Public administration	Novoville app - Novoville is a Civic Engagement Platform that transforms the way citizens access local services			4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM4 – Trust; OASC MIM6 – Security	9	3	16
Public administration	Athens Coordination Center for Migrant & Refugee issues (ACCMR)			4	OASC MIM1 – Context ; OASC MIM2 – Data Modules; OASC MIM4 – Trust; OASC MIM6 – Security	9	2	15
Energy	Energy and Climate Atlas		Helsinki, FIN	4	MIM1, MIM2, MIM4, MIM7	9	3	16
Mobility	Real time traffic of the city		Madrid	4	MIM1, MIM2, MIM4, MIM7	8	2	14
Mobility	MobilityLab EMTMadrid		Madrid	4	MIM1, MIM2, MIM4, MIM7	8	1	13



Mobility	Explore.Porto: a tool to assist citizens in their mobility within the city of Porto and also to provide Tourists with quick and easy access to touristic information and route planning. This tool uses several components such as Digitransit and OpenTripPlanner, and depends on data gathered from multiple sources within (and outside) the municipality (e.g. e-scooter, bus and metro data).		Porto	2	MIM2, MIM7	9	1	12
Public administration	Cartao Porto: a physical and digital card to facilitate the life and interaction with the city services for the citizen of Porto. It provides several services and allows access for digital offering such as commercial vouchers, city information and environmental warnings. It uses a Web Application and Databases to manage data but is also connected to a Data Platform providing Business Intelligence Services;		Porto	1	MIM4	9	1	11
Green Deal	TOUREST will support the development and proliferation of sustainable tourism policies & practices to increase water efficiency in ADRION coastal areas, seeking to: a) minimise the negative impacts of tourism activities on natural heritage, and b) protect increasingly scarce water resources. These focal interventions points will directly contribute to the implementation of the 4th EUSAIR pillar.		Adrian	0				0
Agriculture	Grapes			0				0
Financial	Build location strategies and streamline your operations with Belmap, the 3D digital twin of the built environment		Belgium	2	MIM4, MIM7	9	1	12
Energy	Build location strategies and streamline your operations with Belmap, the 3D digital twin of the built environment			2	MIM4, MIM7	9	1	12
Urban Planning	Build location strategies and streamline your operations with Belmap, the 3D digital twin of the built environment			2	MIM4, MIM7	9	1	12



Mobility	Smart Mobility & Predictive traffic management: We are working on Smart Mobility & predictive traffic management, the link to this project: .			3	MIM1, MIM5	MIM2, MIM5	9	3	15
Urban Planning	Smart Urban Planning, with tools like Digital Twinning & VR and also an Integrated Impact Assessment Model (IIAM) in cooperation with the UDI (Urban Development Initiative)			5	MIM1, MIM5, MIM7	MIM2, MIM4, MIM7	9	3	17
Energy	Energie Transition in cooperation with the UD			5	MIM1, MIM5, MIM7	MIM2, MIM4,	9	3	17
Health	Harvesting and sharing data on air quality and meteorological conditions			4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	8	2	14
Energy	harvesting and sharing data on energy consumption		Maia (PT)	4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	8	2	14
Health	Emission factor (and other historical series)		Maia (PT)	4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	8	2	14
Mobility	parking status			4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	8	2	14
Mobility	traffic conditions			4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	8	2	14
Health	ESG data ecosystem for accurate calculations including scope3 (),		Vastuu	4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	9	2	15
Urban Planning	circulating data in the construction and real estate industries			4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	9	2	15
Public administration	personal data operating helping citizen engagement, literacy and openness ()			2	MIM4, MIM6	MIM6	9	1	12
Mobility	Smart intersection use case where we monitor traffic intersections in urban areas for improving the traffic flow and also to improve the citizens' safety:			4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	9	4	17
Mobility	Smart mobility: use case where we monitor the traffic infrastructure, make predictions and provide support for decision making :-			4	MIM1, MIM2, MIM4, MIM7	MIM2, MIM4, MIM7	9	4	17



Public administration	Smart Parks: use case where we help cities to manage more efficiently their park infrastructure:			3	MIM1, MIM2, MIM7	9	2	14
Public administration	The Turbinator – smart sensor for predictive water maintenance: It can be used for early warning of pollutants or for predictive maintenance of a city's pipeline network for waste- and stormwater. It is based on image processing and edge AI to predict turbidity and water level. The data collected can be used for preventive maintenance of a city or municipality pipeline network for waste- and stormwater. The technical solution of the Turbinator – combining a camera, a focused light beam and image analysis for measuring turbidity – is patent approved in the US, EU and Sweden			2	MIM1, MIM2	9	2	13
Health	SCOREwater (H2020 Innovation Project) focuses on enhancing the resilience of cities against climate change and urbanization by enabling a water smart society that fulfils the Sustainable Development Goals 3, 6, 11, 12 and 13 and secures future ecosystem services.  SCOREwater develops and tests three large-scale demonstrations cases for collecting, computing and presenting various data tailored to needs of our stakeholders. In Barcelona we initiate a new domain "sewage sociology" mining biomarkers of community-wide lifestyle habits from sewage. In Amersfoort we develop new water monitoring techniques and data-adaptive storm water treatment and apply to water resource protection and legal compliance for construction projects within the Göteborg-case.			4	MIM1, MIM2, MIM5, MIM7	8	6	18
Mobility	Project and mobile application on sustainable mobility		Kalmar	7	MIM1, MIM3, MIM4, MIM7	8	2	17
Urban Planning	Regional policy development for spatial planning in Kalmar county		Kalmar	1	MIM7	6	1	8
Mobility	Regional ticketing information and application -			1	MIM7	9	1	11



Public administration	SPOTTED Eu project on satellite data analysis and tools for Urban Green infrastructure management -			3	MIM1, MIM7	MIM2, MIM7	8	3	14
Health	Smart water management for data driven water treatment and buffering Partners: water board			3	MIM1, MIM7	MIM2, MIM7	9	2	14
Mobility	Schwung: predictive traffic management mobile app data collection linked to traffic light operation Partners: Vialis (commercial solution) and civilian participants			4	MIM1, MIM4, MIM7	MIM2, MIM6, MIM7	9	3	16
Smart Retail	Smart retail connecting farmers and other local food producers with retail customers in smart city/society	Lokalno GOR	Slovenia	3	MIM1, MIM3	MIM2, MIM3	5	3	11
Smart Mobility	Smart mobility supporting several use-cases in the smart city: smart parking, multi-modal mobility, route optimization, control room	iPOT	Maribor/Slovenia	4	MIM1, MIM2, MIM3, MIM7	MIM2, MIM3, MIM7	8	4	16
Mobility	IDEA predictive mobility based on floating car data	IDEA project	Netherlands	4	MIM1, MIM4, MIM7	MIM2, MIM6, MIM7	8	3	16

○ **6.2 Annex 2: Priority Datasets from Workshops**

Health	Agriculture	Energy
Sewer pollutant information	Weather Stations	User provided energy signature
Meteorological Data	Ground Humidity Levels	Aggregated energy use by providers
	Forestry data provided by drones	Potential green energy supply
		solar and wind information



		Energy consumption in schools
		Energy data on building level
		EV e-ferry, bus, bike charging stations
		building solar energy potential
		building automation data
		energy certificates
		Calculated energy consumption
		PED planning
		Heat sensors

Mobility	Public Administration	Green deal
Manual vehicle counting	Urban planning licensing	Water level measurements
ANPR camera	Building (BIM) data	Pollutant information
Parking spaces power consumption	3D City model	Water quality
Public transport time schedules	Visitor counters	Air quality



Traffic data	Swim water temperature	Weather station data
Self provided data from students	Building renovation potential	
Railway data		Tree registry
Data from carpooling companies		
NEC mobility data kit		
Mobile devices entering or leaving the city		
Waze and GPS data		
Induction loop data		
Biking pathways		

○ **6.3 Annex 3: Interview question template**

Introduction project/ aim of interviews:

Brief background of the interview participant:

- Affiliation:
- Position:
- Years of experience:

Questions	Notes
Could you tell us about the initiation of project XXX . What's the backstory, what was the need?	



What technical standards and specifications do you consider the most important when it comes to data sharing?	
What type of data do you use/ how do you extract value from it in these use-cases? (format, aggregation, re-use, etc)	
What domains and related data sets are prioritized?	
What would your organisation identify as priority data sets on the local, regional, national and EU-level identified, so far?	
Have you experienced any challenges in accessing / importing the required data in your systems	
Which technologies, platforms, or notable ICT systems have you used in the project?	
What are specific Data space requirements relevant to your use case?	
Relevant Building blocks?	



European data space  
for smart communities

## Deliverable D4.1

### Pilots onboarding and support plan

WP 4 – Pilots support

**Authors:** Clara Pezuela (FIWARE), Flavio Fuart (CCIS), Mateja Pucihar Baebler (CCIS), Nenad Šutanovac (CCIS), Walter Dewancker (OASC), Sophie Meszaros (OASC), Dorottya Varga (IMEC)

**Reviewers:** Ignacio Garcia (Serendipity), Nuria De Lama (IDC), Elisabeth Knudsen (DTU)

**Delivery date:** 29 February 2024

**Dissemination level:** Public

**Type:** Report



Funded by  
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or of the granting authority. Neither the European Union nor the granting authority can be held responsible for them



## Revision History

Author Name, Partner short name	Description	Date
Clara Pezuela (FIWARE)	Table of Contents	13/11/2023
All authors	First Draft deliverable	22/12/2024
All authors	Second Draft deliverable	31/01/2024
All authors	Version for revision	16/02/2024
Reviewers	Version with comments	23/02/2024
Clara Pezuela	Final version	28/02/2024

## Abbreviations

Abbreviation	Definition	Abbreviation	Definition
WP	Work package	EU	Europe
DS4SSCC	Data Space for Smart and Sustainable Cities and Communities (former name of the data space)	DS4SSCC-DEP	Data Space for Smart and Sustainable Cities and Communities - Deployment project
TEF	Testing Experimental Facilities	IT	Information Technology
API	Application Programming Interface	Q&A	Questions and answers
MPC	Mentor Program Coordinator	sync	synchronisation
MIM	Minimal Interoperability Mechanism	KPI	Key Performance Indicator



## Table of Contents

<b>1 Introduction</b>	<b>6</b>
1.1 Overall approach and process	6
1.2 Innovation methodology	8
1.3 Supporting roles	9
1.4 Links to other project activities	10
<b>2 Pilots onboarding</b>	<b>12</b>
2.1 Onboarding process and tools	12
2.1.1. Onboarding workshop	12
2.1.2. Onboarding package	13
2.1.3. Individual workshop	13
2.1.4. Pilot plan	14
2.1.5. Support centre	15
<b>3 Mentoring program and monitoring</b>	<b>17</b>
3.1 The goal of mentoring	17
3.2 Timeline of mentoring and monitoring program	17
3.3 Roles and responsibilities	17
3.3.1. Mentor: role and responsibilities	17
3.3.2. Mentor program coordinator's (MPC) role and responsibilities	18
3.3.3. Mentee (pilot): role and responsibility	19
3.3.4. Expert: role and responsibility	20
3.4 Governance and Mentors management	20
3.4.1. Tools to be used for Mentoring and Monitoring	20
3.4.2. Mentors team	21
3.4.3. Mentor program	21
3.5 Monitoring process	22
<b>4 Training program</b>	<b>24</b>
4.1 Training needs	24
4.2 Training methods	26
4.3 Training packages	26
4.4 Delivery of trainings	28
4.5 Evolution of training material and learning experience	29
<b>5 Pilots and evaluation assessment</b>	<b>30</b>
5.1 Purpose of the evaluation	30
5.2 Evaluation process	30
5.3 Indicators (Key Performance Indicators)	31
5.4 Evaluation tools	32
<b>6 Conclusions and next steps</b>	<b>34</b>
<b>Annex 1: Pilot profile</b>	<b>35</b>



**Annex 2: Milestones monitoring overview**

**36**



## Executive Summary

The present document aims at defining the strategy and action plan for the overall support to the pilots selected in the various rounds of the Call for Pilots for the deployment and validation of the European Data Space for Smart Communities blueprint. The support activities include the onboarding into the data space, the monitoring of all the pilot activities, the training about the related technical and business matters, and the periodic evaluation of performance and collection of feedback about the process and the blueprint.

The document introduces in Section 1 the overall approach and process to follow across the different tasks included in the WP4, and the innovation methodology that will be applied across the whole process. This section also summarises the various roles that have been defined to carry out all the referred activities as part of the support team.

The following sections detail the specific goals and plans for each of the supporting activities. Section 2 is focused on the onboarding process of the pilots into the data space, detailing the tools and mechanisms that will be used. Section 3 is describing the mentoring program and monitoring process, detailing the role of the mentor and the experts and how they will be governed and will operate in coordination. Therefore, Section 4 explains the purpose of the training program, the potential needs, the method and an overview of the pre-designed training packages for the pilots. Finally, Section 5 describes the meaning of the evaluation in the context of the pilots, how the evaluation process will be and the indicators which will be used to assess the performance and progress of the pilots.

Guiding the pilots through the endeavour of onboarding and operating a data space is the main mission of the support team in the European Data Space for Smart Communities. Since the pilots are awarded in any of the rounds of the open call, the support team (under the umbrella of the WP4) will be providing them with all the necessary elements to do their project in the best possible way. Thus, a mentor will be assigned already during the contract phase to accompany them from the very beginning. An onboarding workshop with all the winning pilots in each round is organised to welcome them to the data space and provide a smooth landing. After that, each mentor organises an individual meeting with her pilot to detail the working plan, agree on the monitoring program and profile the pilot at starting time. The mentor will be supported by the experts in different topics for the continuous support to the pilot. In every evaluation, the mentor will assess the status of the indicators to verify the evolution of the pilot, collecting as well the feedback about the blueprint valuable for its evolution.

This WP works in close collaboration with WP2, WP3 and WP5.



## 1 Introduction

The overall mission of Work Package 4 (WP4) Pilots Support is to design and coordinate an overarching pilot program for the selected smart communities from the calls for pilots and to provide operational support for them along its execution. To achieve this goal, WP4 is split into four tasks:

- Task 4.1 (T4.1): onboarding process of the selected pilots from the open calls including continuous technical and business support.
- Task 4.2 (T4.2): continuous mentoring and monitoring of the execution.
- Task 4.3 (T4.3): training program to acquire the required skills for executing the pilots.
- Task 4.4 (T4.4): periodic evaluation of the pilots to ensure the requirements are fulfilled.

This document provides a detailed strategy and concrete action plans for each of the four cornerstones of the pilot program (i.e., onboarding, mentoring and monitoring, training, evaluation). In addition, WP4 has a strong innovation management focus to help the selected pilots create viable and sustainable business models for their data spaces.

The document will refer indistinctly to DS4SSCC-DEP and European Data Space for Smart Communities to name the deployment project for the related data space.

### 1.1 Overall approach and process

The tasks included in WP4 are aligned with the planning of the call for pilots, and are interrelated, as can be seen in Table 1. The above-mentioned tasks will work in coherence and consistency with this plan and are interrelated with each other.

Table 1: Calls timeline (source: WP3)

Submission round	1st round	2nd round	3rd round
Submission Period	March 11th 9AM CET - May 10th 23.59 CET (2 months)	June – August 2024 (3 months)	October – November 2024 (2 months)
Evaluation Period	June – July 2024	September – October 2024	December 2024 – January 2025
Notification	August 2024	November 2024	February 2025
Number of Selected Pilots	1-2	4-6	4-6
Feedback to pilot teams and re-submission of re-scope proposal	August – September 2024	November – December 2024	February – March 2025
Onboarding workshop	September 2024	December 2024	March 2025
Implementation Period	October 2024 – September 2025/January 2026 (16 months)	January 2025 – December 2025/April 2026 (16 months)	April 2025 – March – May 2026 (14 months)

Figure 1 summarises the sequence of the different actions that this WP will carry out with the selected pilots in the three phases of the open call. The process is only defined for the first batch (see



Batch 1 label), as the other two batches (Batch 2 and Batch 3 in the figure) will follow the same timeline with a later starting date. The colour codes indicate which action belongs to which task: T4.1 in orange; T4.2 in green; T4.3 in blue; and T4.4 in pink. The grey colour represents common actions for all the tasks, such as the elaboration of this deliverable.

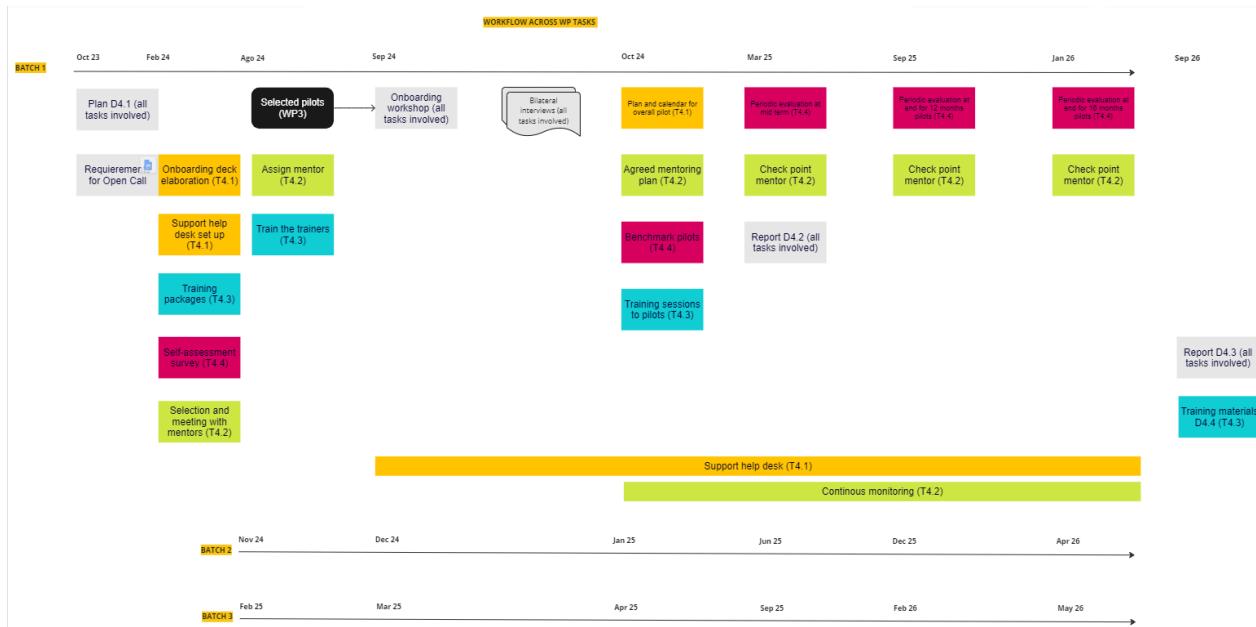


Figure 1: Summary of timeline and activities to carry out during the pilots support

In the period between the start of the project and the end of February 2024, the submission of this deliverable, the main action points this WP intends to carry out are the following:

- Elaborate the working plan for all the tasks for the whole duration of the project (D4.1). The working plan will be revised in the mid-term evaluation report of the project (D4.2) and updated, if needed.
- Collect all the requirements that this WP requires for the call for pilots text. This includes:
  - a) description of what the pilots may expect in terms of support, training, monitoring and evaluation
  - b) the required effort that needs to be committed by the pilots in their budget for addressing the activities in this WP (support, training, meetings, etc.)
- Establish the evaluation criteria to assess pilot performance during the execution.
- Prepare the onboarding deck with all essential information and material that the pilots will need when joining the data space.
- Set up a help desk tool that will be used by the pilots to request, track and get support from the project.
- Prepare the different training packages that can be required by the pilots according to their background knowledge.
- Prepare the self-assessment survey to collect at the beginning of the pilot the baseline values for the defined evaluation criteria to benchmark the pilots.
- Select the pool of mentors that will be assigned to the pilots and train them about their mission and responsibilities.

Following the WP3 Open Call selection process, and contract signature for each batch of the projects, this WP will organise an intake meeting with all the winners to welcome them and explain to them



the onboarding process. At this point in time, we will also assign the mentors to the pilots, and we will train the experts and the mentors, when required.

Then, a bilateral meeting with each pilot will be set up to obtain the essential information from them to define the training program, the monitoring plan and the evaluation baseline according to their profile. Based on this information, we will define together with each pilot, the overall support plan for the whole duration of the pilot and the mentoring plan. We will also produce the benchmark of the pilot in relation to the defined indicators for evaluation. This will allow us to compare the evolution of the pilots with regards to these indicators at mid and end of the project.

There will be a mid-term evaluation for each pilot, during which WP4 will assess the status of the pilot execution, applying the corrective measures, when needed. The collected feedback at mid-term will feed the call text (to be published in March) for the next stages. The same assessment will be carried out at the end of the pilot program for the final report.

The support helpdesk (T4.1) and the monitoring program (T4.2) will run continuously during the full duration of the pilot program. The evaluation (T4.4) will run at certain points of the process to collect the feedback and assessment from the pilots. All the tasks contribute to the report in M18 (D4.2) and the report in M36 (D4.3). T4.3 will collect all the training and other materials in a final deliverable in M36 (D4.4).

## 1.2 Innovation methodology

### The Innovatrix framework

To create a foundation for sustainable data spaces after the project is completed, WP4 has a strong business modelling focus. We propose an innovative approach to managing innovation through a targeted, yet adaptable business modelling framework known as Innovatrix, developed by Imec. Innovatrix comprises eight criteria integral to each (digital) innovation:

- Customer Segment: Identifying the most significant user groups for the proposed innovation of the product or service.
- Needs: Addressing the critical problems faced by these customer segments.
- Current Practices: Understanding how customer segments currently interact with existing products or services.
- Value Proposition: Defining the added value of the proposed innovation over current practices.
- (Digital) Solution: Outlining the components required to deliver the value proposition, including capabilities, timeframe, technical development, costs, outsourcing, etc.
- Barriers: Identifying potential reasons the innovation might not be adopted or could fail.
- Value Capture: Determining the value the entrepreneur receives from a specific customer segment, including revenue models and pricing schemes.
- Key Partners: Establishing relationships with necessary partners to realise the innovation.

For each innovation criterion, relevant assumptions are documented. These assumptions serve as the foundation of an innovation project and are continuously validated or invalidated at key milestones throughout the process. Assumption validation can take various forms, such as workshops facilitated by a coordinator, interviews, or self-assessment. Project managers and entrepreneurs can leverage the digital Open Innovatrix Platform for the entire process.



### Relation with the Data Cooperation Canvas

Innovatrix builds upon the Data Cooperation Canvas developed during the preparatory action of Data Space for Smart Communities (DS4SSCC). While both the Data Cooperation Canvas and Innovatrix share similar elements, the former focuses on describing and exploring data cooperations, whereas Innovatrix specifically concentrates on value creation and value capturing from a business modelling perspective. Therefore, following a comprehensive self-assessment of the 14 elements of the Data Cooperation Canvas, we will concentrate only on the most essential building blocks to construct our innovation management canvas and oversee the value creation process.

### Innovation Management Approach in the DS4SSCC-DEP Project

The Innovatrix tool is proposed for use throughout the following steps as part of the onboarding and mentoring and monitoring plan of WP4, with touchpoints with pilots facilitated through periodic interviews, email communication, and videoconferencing support:

- Pilot owners will complete a digital version of the Data Cooperation Canvas as part of their onboarding process.
- Relevant aspects of the Data Cooperation Canvas, such as Key Partners, Resources, Business Case, and Added Value, will be assessed and translated into the Innovatrix assumption framework.
- Each pilot will have its use case on the Open Innovatrix Platform (opened and managed by Imec), accessible for consultation at any time.
- Innovatrix criteria will be discussed with each pilot owner using guiding questions, with a specific focus on validating or invalidating previous assumptions and determining the next steps.
- Follow-up interviews will be conducted as needed.

The results of the innovation management approach will be documented in the template progress minutes of the mentors (see more information in Section 3.4.1). The main goal is to create a viable business model for each pilot by the end of the piloting period.

## **1.3 Supporting roles**

This section summarises the different roles within the support team that will intervene throughout the piloting program. Each of them is acting at different stages of the pilot and will be referred to in the rest of the sections in this document. The section 3.3 describes in detail the responsibilities for each role.

We identify 3 main roles: Mentors, Experts and Trainers. Within WP4, a list has been created in which project partners could decide which role they would take upon according to their expertise and availability. One person can take upon more than one role. All the partners will contribute to any of the roles, according to their allocated effort in WP4 primarily, but additionally from other WPs.

Figure 2 represents the three roles and the relationships among them. The following considerations apply:

- Every pilot has a unique mentor who acts as a main entry point of the pilot into the data space. Mentors are gatekeepers for any request or contact with the project.
- One mentor can be assigned to one or more pilots depending on the workload and availability.

- The pilots may request at any time, via [support@ds4sscc.eu](mailto:support@ds4sscc.eu) address, support from an expert. A ticketing system will be set up, thus all the requests will be registered, assigned and tracked through the tool. Each mentor will assign every support request from their pilot(s) to the different experts, depending on type of request and required knowledge.
- The mentor will try to balance the assignment of requests according to the available time of each expert and the overall workload.
- Each expert may attend to requests from several pilots. The requests can be about technical, business, finance or ethical aspects.
- The mentor will request the required training for the pilot according to their training needs, considering the workload and available time of the trainers.
- Every pilot is required to carry out all the proposed training packages, since they are considered essential for the good execution of the pilot.

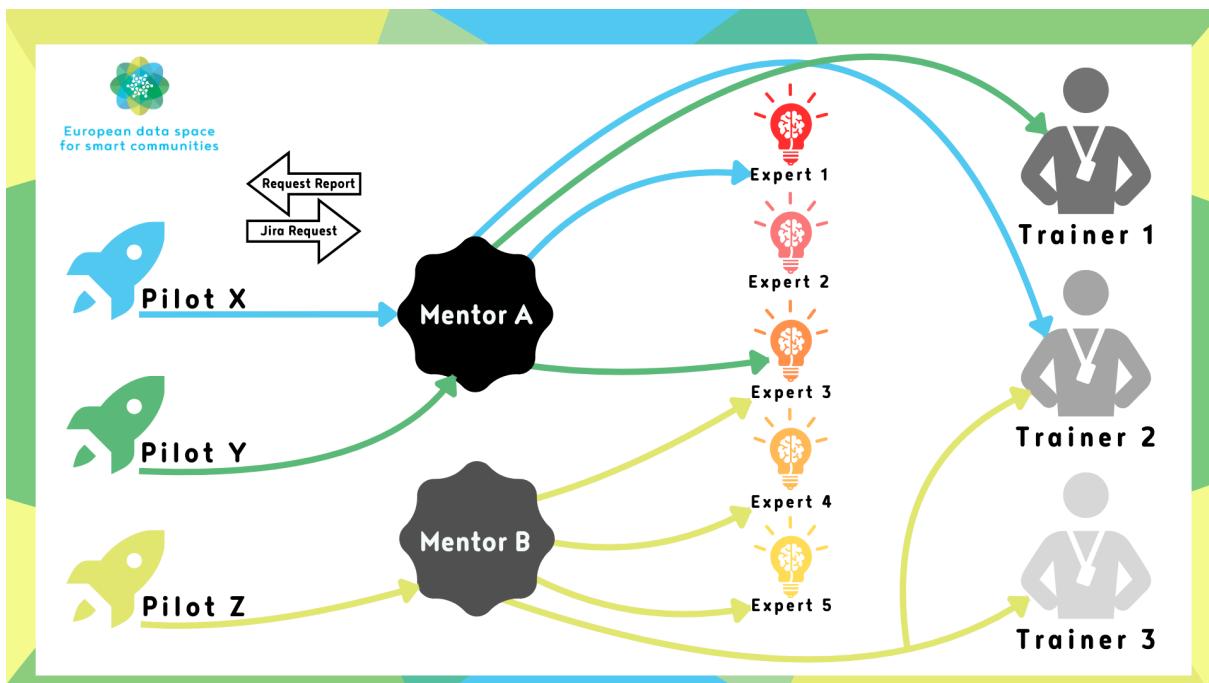


Figure 2: Supporting roles for the pilots

## 1.4 Links to other project activities

The work carried out in WP4 Pilots Support is highly relevant to other WPs, such as:

- WP2. The collected feedback from the pilots during the evaluation phase will serve as primary input for the update of the data space blueprint. The results of the pilots will be communicated to the Stakeholder Forum.
- WP3. The evaluation criteria (performance indicators) and estimation of effort/budget allocation for supporting activities are included in the requirements of the Open Call text. The mentor of the pilots is assigned already during the contract phase of the call for pilots.
- WP5. The supporting activities will also assist in understanding the impact of the data spaces as well as in sustaining the solutions by co-creating a sustainability plan. In fact, WP4 will act as the main interface to the pilots in order to gather data that will feed the impact assessment framework. The Do It Yourself communication toolkit will be distributed to the pilot owners within the onboarding package described later, to ensure the communication



and dissemination of the pilot progress and results are communicated following the project branding and guidelines.



## 2 Pilots onboarding

Between 9 and 14 pilots will be selected through the three waves of the Open Call launched by the project under the WP3. The pilots have to propose a cross-sectorial and cross-country use case of data sharing within the European Data Space for Smart Communities. These pilots will bring their own business case and technical infrastructure to the data space, and we need to provide them support in the onboarding process and in resolving any issue (technical, business, finance or ethical) during the full execution of the pilot.

In order to ensure a smooth onboarding of the pilots to the data space, we have defined a set of activities that will take place once the pilot is awarded and entered into the contract phase.

### 2.1 Onboarding process and tools

The onboarding process includes following steps:

- 1) Assign a **mentor** to the pilot during the contract phase of the Open Call to favour the landing into the project and guide the pilot through the first actions in the data space. All the details about the mentoring process are in section 3.
- 2) Organise an **onboarding workshop** with all the awarded pilots in each open call round.
- 3) Provide them an **onboarding package** with all the documents, instructions and resources available in the data space to carry out their pilot.
- 4) Set up an **individual workshop** per pilot to elaborate a profile about their status, characteristics and knowledge and establish a benchmarking to be used for further assessments.
- 5) Elaborate the **pilot plan** for each of the pilots with all the details and timeline of mentoring, monitoring, training and evaluation activities for the whole duration of the pilot.

#### 2.1.1. Onboarding workshop

This workshop will be organised at the launch of the winning pilots in every open call round. All the pilots must attend this workshop at the beginning of the contract phase. Previously, a mentor should have been assigned to them so he/she can facilitate and ensure their participation in the workshop.

The purpose of this joint workshop is to introduce the awarded pilots into the data spaces by providing them the guidelines, instructions and materials to onboard their pilots into the overall ecosystem of the data space.

Table 2 shows the basic information about this kind of session.

Table 2: Onboarding workshop factsheet

Chair of the workshop	WP4 Pilots Support leader
Expected attendees	At least one representative from each awarded pilot of every open call round
Agenda	<ul style="list-style-type: none"><li>● Introduction to the European Data Space for Smart Communities (includes overview, context, blueprint)</li><li>● Brief presentation of each pilot by its representative and assigned mentor (template to be provided)</li><li>● Explanation of supporting activities and onboarding package</li></ul>



	<ul style="list-style-type: none"><li>• Q&amp;A</li><li>• Setting up of individual workshops with each participant pilot</li></ul>
<b>Duration</b>	2 hours max
<b>Format</b>	Online

### 2.1.2. Onboarding package

The onboarding package includes materials with all the necessary documentation, references and resources for the execution of the pilots. It will be presented and explained during the onboarding workshop, thus it will be prepared in advance to the first workshop and refined at every open call round according to the provided feedback from the pilots.

Below is the list of potential materials to be included:

- Overall description of the European Data Space for Smart Communities.
- Inventory of the Data Spaces Blueprint and instructions about how to use it.
- Deliverables with the details about the different elements of the blueprint.
- List of training packages with the corresponding description (see Annex 2).
- The Pilot Profile template with a guide to fulfil it (see Annex 1).
- Indications about how to use the support tool (Jira) in case of any request.
- Access to the online self-assessment survey to be completed at the beginning, at mid-term and at the end for the evaluation of the pilot.
- Communication package with all the instructions to use the data space branding, social networks and other communications channels and spread the word about the data space and their pilot.

In most of the cases, this material will be provided by the WP4, but some elements will come from WP2 (blueprint) and WP5 (communication package).

### 2.1.3. Individual workshop

After the onboarding workshop, each pilot will set up an individual workshop with its mentor to work on a specific pilot plan and collect all relevant information. The meeting can be online or physical depending on the location of the pilots and the mentors, although online meeting is recommended.

Following working items need to be included in the agenda of the meeting:

- Fulfilment of the **Pilot Profile** (see in Annex 1). It is a cheat sheet which allows to profile the pilot according to all relevant dimensions for a data space. The Pilot Profile includes:
  - The **Data Cooperation Canvas** produced by the preparatory action of the data space allows partners and stakeholders of the pilot to clearly identify the needs for data sharing, define its purpose as well as lay out the different components (technical, governance, business models, implementation) that are required to ensure the success of the cooperation. The canvas is divided into three main parts providing:
    - The context of the cooperation ('Why')
    - The governance and business models underlining the cooperation ('Organisational')
    - The technical aspects of the cooperation ('Data & Technical')



- The **Impact** dimension which comprises the different stages of maturity of a data space (explore, validate, define, implement). This part of the profile will identify in which phase of maturity is the pilot at the beginning of the project and to what extent it evolves during the pilot execution. Each phase defines a concrete status for each dimension of the data space (i.e., governance, value creation and technical infrastructure). Each dimension in every stage will be assessed through a set of indicators.
- The **Building Blocks** part collects the standards and implementations that each pilot has adopted for each building block. The referred building blocks are the ones recommended by the Data Spaces Support Centre<sup>1</sup> (DSSC) in its blueprint v1.0. This information is of relevance to assess the degree of compliance and interoperability of the pilot with the Smart Communities data space and other related European data spaces.
- Completion of the **self-assessment survey for benchmarking**. Each pilot will be evaluated three times during the overall duration of the pilot (see section 5). The evaluation will be carried out through an online survey to be fulfilled by the pilot at the beginning, at mid-term and at the end of the pilot. The survey inquires about a set of indicators that have been defined to measure the performance and status of each pilot. During this first individual workshop, the mentor will guide the pilot through the survey to solve all possible doubts and support them in the fulfilment. The results of this first survey will serve as a baseline (benchmark) for establishing the comparison with the results at mid-term and at the end, and observe the evolution of the indicators.
- Design and completion of a **pilot plan**. Relying on the implementation plan proposed by each pilot in the open call proposal, the mentor will refine with the pilot the timeline of the checkpoints, evaluation milestones, training events and other support interventions that would be required.

#### 2.1.4. Pilot plan

This is the plan that will be agreed upon with each pilot to carry out the monitoring and evaluation by the mentor with the support of experts and trainers. During the individual workshop set up by the mentor with the pilot, the mentor will define with the pilot the milestones for continuous monitoring and assessment of the performance indicators. The mentor will apply the monitoring process detailed in section 3.5.

This plan will take into account the implementation plan described by the pilot in the project proposal submitted to the open call. The proposal should include the required allocation of effort (and budget) for accomplishing the supporting activities like the onboarding and individual workshops, the essential training, the evaluation surveys and the support requests from experts. Table 3 indicates an estimation of the expected dedication for each of these activities from the pilot.

Table 3 – Expected effort allocation in pilots for supporting activities

Activity	Duration/frequency	Estimated effort (in days)
Joint onboarding workshop	2 hours	0,25
Bilateral interview for profiling/benchmarking	2 hours	0,25

<sup>1</sup> [www.dssc.eu](http://www.dssc.eu)



Training at onboarding	2 hours	0,5
Additional training	See table below.	The exact list of trainings will be prepared based on the onboarding interview
Request support from experts		1 day/month
Evaluation at mid term	2 hours	0,25
Evaluation at the end	2 hours	0,25
Check points with mentor	1 hour	1 hour/per week

Table 4. Estimated effort allocation in pilots for trainings

Training topic	Target group			
	Local authorities - demand side		Solution providers - supply side	
	Decision makers	IT experts	Business developers	IT experts
Technical	2	16	1	16
Business	1		5	
Governance and Legal	4	2	2	2
Leveraging TEF & other infrastructure	1	16		16
<b>Total hours (including self-learning)</b>	<b>8</b>	<b>34</b>	<b>8</b>	<b>34</b>

## 2.1.5. Support centre

All the pilots will have access to an online supporting tool which allows them to request at any time the support of any expert, the need of some training, the advice on any issue or the resolution of a doubt. The pilots will need to send their request to the email address [support@ds4sscc.eu](mailto:support@ds4sscc.eu).

In order to facilitate either the collection of these requests and the monitoring of their progress, the project has decided to set up a ticketing system tool to organise and attend all the possible requests in the most efficient manner. The project has selected an open source tool, [Jira from Atlassian](#), that will be provided by FIWARE in a licensed mode with no limit of users.

Both the support team and the pilots will create accounts in the Jira system to create requests that will be labelled and assigned to the right person. As explained in section 1.3, the project has collected a list of experts, mentors and trainers. The requests created by a pilot will be automatically assigned to its mentor, and the mentor will re-assign each request to the most suitable expert, depending on the topic.

Every request should be automatically replied in a maximum of 24 hours during working days (from Monday to Friday, excluding weekends). However, the resolution time of each request may vary depending on the complexity and availability of the required expert. Thus, after consulting with the assigned expert, the mentor must inform the pilot about the estimated time of resolution. In case of



public holidays or vacation periods, the mentor must ensure a replacement person who can attend the pilot in her/his absence. Thus, every pilot will be assigned with a main mentor and a deputy mentor who will act as the mentor when he/she will not be available. The experts, trainers and mentors have to provide their days off calendars to avoid any lack of support due to this reason.

In addition to the online support, the mentor can propose any focused meeting between the pilot and some expert to discuss specific issues; or request a training session from the training team.

The administrators of the tool will provide statistics about the use of the system, the number of requested issues and the percentage of resolution in due time.

The screenshot shows the Jira project 'DS4SSCC-Support' with the following details:

- Project Information:** Key: DSSCCSUP · Lead: Clara Pezuela · Category: None · URL: No URL
- Navigation:** Overview · Administration
- Summary:** This is the support system for the European Data Space for Smart Communities.
- Issue Types:** Sub-task · Task
- Workflows:** Screens · Fields · Versions · Components · Roles · Permissions · Issue Security · Notifications · HipChat integration · Development tools · Issue Collectors
- Issue Types (Detailed):** Keep track of different types of issues, such as bugs or tasks. Each issue type can be configured differently.
  - Scheme: **DSSCCSUP: Simple Issue Tracking Issue Type Scheme**
  - Task
  - Sub-task · SUB-TASK
- Workflows (Detailed):** Issues can follow processes that mirror your team's practices. A workflow defines the sequence of steps that an issue will follow, e.g. "In Progress", "Resolved".
  - Scheme: **DSSCCSUP: Simple Issue Tracking Workflow Scheme**
  - DSSCCSUP: Simple Issue Tracking Workflow
- Screens (Detailed):** Screens allow you to arrange the fields to be displayed for an issue. Different screens can be used when an issue is created, viewed, edited, or transitioned through a workflow.
  - Scheme: **DSSCCSUP: Simple Issue Tracking Issue Type Screen Scheme**
  - DSSCCSUP: Simple Issue Tracking Screen Scheme · DEFAULT
- Versions:** For software projects, JIRA allows you to track different versions.
  - This project has no unarchived versions. Add a version
- Components:** Projects can be broken down into components, e.g. "D against different components".
  - This project does not use any components. Add a component
- Roles:** JIRA enables you to allocate particular people to specific other settings, like notifications and permissions.
  - Project Lead: Clara Pezuela
  - Default Assignee: Unassigned
  - Roles: View Project Roles
- Permissions:** Project permissions allow you to control who can access issues. Access to individual issues is granted to people.

Figure 3: Jira space for pilots' requests support



## 3 Mentoring program and monitoring

### 3.1 The goal of mentoring

The awarded pilots of the Open Calls are followed by a mentor who monitors and guides mentees (the pilots) through the various stages of the data space blueprint deployment with the support of experts and trainers. While mentors act as a liaison between the pilots and DS4SSCC-DEP, meaning that they will link the pilots to relevant resources and knowledge; experts and trainers will offer technical and business support.

### 3.2 Timeline of mentoring and monitoring program

The mentoring and monitoring program accompanies the four stages of the data space pilot deployment stages (see Figure 4): explore, validate, define and implement.



Figure 4: Data Space deployment stages

Throughout these stages the pilots should achieve certain pre-defined Key Performance Indicators (KPIs) and milestones for the governance, data value creation, technical infrastructure, and innovation management approach of the data space. Those pilot performance indicators are described more in detail in section 5.3.

In order to facilitate a smooth transition from the pilot preparation for the call for pilots to the pilot execution, the mentor will be assigned during the contract phase of selected pilots to guide them through the onboarding phase. At the start of each pilot, the mentoring team will facilitate support and accompany the pilot holders in the technical process of onboarding their environments, infrastructures and solutions into the data space. During the overall pilot development, the support team will provide to the open call winners the required knowledge and support for the integration, testing and validation of their pilot into the data space; and business advice in focusing their market and finding business opportunities (e.g., through the innovation management approach). The mentor will also accompany the pilot at the three mandatory evaluations of performance and complete the self-assessment survey. Through the mentor, the DS4SSCC-DEP will gather feedback of improvements for the next call phase (WP3) and further versions of the blueprint (WP2).

### 3.3 Roles and responsibilities

Complementing the introduction of the supporting roles in section 1.3, this section dives deep into the roles and responsibilities in relation to the mentoring program.

#### 3.3.1. Mentor: role and responsibilities

In our project setup, each pilot is overseen by a mentor who may handle multiple pilots concurrently. These mentors serve as the primary link between the project team, pilots, and the Mentor Programme Coordinator (MPC).

For each pilot, a tailored mentoring plan is developed and executed by the assigned mentor. They document learnings, to-do items, opportunities, and Key Performance Indicators in a standardised



internal database. Mentors can leverage a pool of experts for additional project support. Regular internal sync calls, scheduled for optimal participation, provide a platform for mentors and the MPC to align, discuss challenges, and share best practices across projects. The mentors should establish reports back to the MPC and WP4 leader with results and documentation by using a standard template (refer to [Public Info repository](#)).

This streamlined approach ensures effective mentorship, collaborative problem-solving, and continual improvement across all projects.

*Table 5: Key responsibilities of Mentors*

Guidance	Mentors offer guidance to the pilot project through the pool of experts, facilitate the access to the training program and trainers to learn about data space technologies, methodologies, and best practices.
Networking and Connections	Mentors help the pilots expand their professional networks and connect with other individuals in the data space field. They facilitate introductions to experts, peers, and potential collaborators, fostering valuable connections.
Problem-Solving and Conflict Resolution	Mentors act as sounding boards for the pilots, helping them to navigate and resolve challenges that arise during the pilot project implementation. They provide strategies for overcoming obstacles.
Monitoring	Mentors work with the pilots to establish clear and measurable goals for their pilot projects. They provide assistance in tracking progress (self-assessment survey and evaluation check points). Overview timeline with most important milestones in <b>Annex 2</b> .
Reporting	The mentors should report back to the MPC with the progress and results of their assigned data space pilots. They will use the Pilot Profile document which is integrated and used together with the pilot progress minute template as means of reporting (refer to <a href="#">Public Info repository</a> )
Wellbeing	Mentors provide ongoing motivation and encouragement to mentees, helping them to maintain enthusiasm and perseverance throughout the project lifecycle. They recognize achievements and foster a positive learning experience.

### 3.3.2. Mentor program coordinator's (MPC) role and responsibilities

The Mentor Program Coordinator acts as a central figure in the mentorship program, managing recruitment of mentors, fostering collaboration, addressing mentor needs, and ensuring effective communication and coordination among consortium partners. Their role is instrumental in maximising the success of pilot projects and promoting a culture of shared learning and best practices within the consortium.

*Table 4: Key responsibilities of the MPC*



Mentor Recruitment and Coordination	Collaboratively recruits mentors from consortium partners in coordination with the WP4 leader. Ensures alignment between mentors and the overall goals of the mentorship program. Creates a platform for discussing challenges faced by pilot projects and sharing successful practices.
Needs Assessment:	Identifies and addresses the overarching needs of mentors, ensuring they are equipped to provide effective support to pilot projects.
Monitoring and Evaluation	Assists mentors in monitoring pilot projects throughout their duration. Assists mentors in evaluating the performance and results of the pilots at the conclusion of the projects.
Liaison across Consortium Partners and Work Packages	Acts as a communication bridge between the WP4 leader and consortium partners within WP4. Identifies links across different work packages, such as WP3 and WP5 with the WP4 leader.
Support in Network Events	Assists in organising network events to enhance connectivity and knowledge exchange within the consortium and the WP4 leader. Promotes a collaborative environment for mentors and pilot projects to network and share experiences.

### 3.3.3. Mentee (pilot): role and responsibility

A pilot is referred to as a mentee. This means that various individuals may form the mentee in a pilot project. The mentee is expected to deliver according to its application a cross-sectorial use case with the help of the data space blueprint. To help the deployment the mentees are expected to achieve certain KPIs and milestones with the support of their mentors.

*Table 5: Key responsibilities of Mentees*

Set goals	Identify the challenges, opportunities and the vision of the pilot within the data space
Document	Use the pilot profile and other templates provided by the mentor of easily readable and shareable documentation.
Data Space blueprint	Use and validate the data space blueprint for developing the use case submitted in the pilot and rely on the support of the mentor, experts and trainers.
Monitor KPIs	Report on the indicators detailed in section 5.3 when requested, trying to achieve the target value.



### 3.3.4. Expert: role and responsibility

The mentor team can also consult a sounding board group of experts. They rely on a pool of experts to provide necessary support to the pilots' mentors on various aspects like smart cities, data spaces, technology, business development, business modelling, data governance, technology, business, legal and deeper technical support for the integration, testing and validation of their pilot into the data space. The mentor is the entry point for the pilot, the hub person towards the project, but he/she will require the support of the experts (for technical and business requests) and the trainers (for the training program) to guide the pilots.

## 3.4 Governance and Mentors management

### 3.4.1. Tools to be used for Mentoring and Monitoring

#### Data Space Blueprint for Smart Cities and Communities

The preparatory action ‘Data Space for Smart and Sustainable Cities and Communities’ (DS4SSCC) provided to the ‘European Data Space for Smart Communities’ (DS4SSCC-DEP) with a data space blueprint. The blueprint provides guidance for data space governance, the building blocks of a data space together with technical specifications, and a reference architecture. These items are documented in reports and are available on the website <https://inventory.ds4sscc.eu/> for the public.

#### Pilot Profile document

The pilot profile is an additional output of the preparatory action DS4SSCC which serves as an ‘at a glance’ overview of a data space. It has a dedicated part for documenting the governance and technical aspects of a data space. The DS4SSCC-DEP complemented the canvas to help mentors in the monitoring process. As such, it also provides a checklist of the building blocks of the data space and space for documenting the phases of deployment and. The Pilot Profile can be consulted in Annex 1 and available at [Public Info repository](#).

#### Progress Minutes Template for Mentors

The mentors will use the **Pilot Profile** document as guidance and mindmap for their coaching sessions and is embedded in the **progress minute template for mentors** (refer to [Public Info repository](#)). focusing on the four stages of the data space pilot deployment and their reached pilot performance indicators, detected risks and training needs and a timing as means of reporting.

**Annex 2** is provided to mentors as an overview of the upcoming activities which helps keep track of expected milestones and KPIs.

#### Nice to know document for mentors

Facultative examples of the application of 4 stages of innovation management process on the data space deployment (refer to [Public Info repository](#)).

This document can serve as a source of inspiration but mentors are free to use their own approach.

#### The Innovatrix

Innovatrix builds upon the Data Cooperation Canvas developed during the preparatory action (DS4SSCC). While both the Data Cooperation Canvas and Innovatrix share similar elements, the former focuses on describing and exploring data cooperations, whereas Innovatrix specifically concentrates on value creation and value capturing from a business modelling perspective.



### 3.4.2. Mentors team

All partners in WP4 will provide minimum 1 mentor. Each mentor will be representing a minimum 2 pilot projects of a total of 10-12 selected pilots out of probably 20-24 pilot applications in 3 waves.

The mentor team is composed of professionals with different areas of expertise and diverse coaching skills so that there are sufficient human resources in the DSS4SSCC-DEP project to cope with the support of the pilots on the level of mentoring and monitoring.

The team comprises a diverse mix of men and women with expertise in smart cities, data spaces, business development, business modelling, data governance, marketing and communication, procurement, financing strategy, business and sustainability, European digital landscape, communication, facilitation, financial planning, interoperability, MIMs...

The mentor team will be supported by a mentoring program coordinator and the WP4 leader.

### 3.4.3. Mentor program

The mentors of each pilot with the support of the expert group will mentor the selected pilots to achieve their objectives and at the same time also guide the pilots toward the wider strategic objectives of the DS4SSCC-DEP project.

The mentor is the entry point for the pilot, the hub person towards the project, but he/she will require the support of the experts (for technical and business requests) and the trainers (for the training program) to guide the pilots.

For each pilot individual mentoring will be created.

The Mentoring is aimed at guiding the pilots through their journey with a 12-16 months of customised service, articulated in several stages, to fit the needs.

There will be 3 waves of onboarding followed by a mentoring period of the pilots. Between each wave there will be a period of several months.

Across the stages of the plan there will be regular update meetings between the mentors and the pilots to keep track of progress.

The tools described above are proposed for use as part of the mentoring and monitoring plan of WP4, with touchpoints with pilots facilitated through periodic interviews, email communication, and videoconferencing support.

#### **Following the activities which are to be conducted by pilot mentors with their allocated pilot on regular basis**

- Regular Sync up with pilot contact – weekly or bi-weekly
- Review of milestones – at each milestone as specified in Annex 2
- Notes/summary of challenges and learnings for deliverable – pilot mentors will maintain a record of challenges faced and learnings for each pilot they are mentoring which in the end is aggregated into the deliverable(s) for this WP4 (minutes template)



- Regular internal sync – A sync between the pilot mentors and pool of experts on Monthly basis

When feasible, the internal sync activities will be carried out in the context of the periodic WP4 meetings to avoid replication of meetings. Only when needed, bilateral meetings will be set up.

As mentioned before, at the pilot starting, the WP4 will organise an onboarding workshop with all the winners at each open call wave. The main goal of this workshop will be to meet the pilots, explain to them the onboarding process and present them the training, monitoring and evaluation plans. After this collective workshop with all the winners, an individual meeting will be set up with each pilot to discuss specific plans and collect from them the required information and needs for profiling and benchmarking every pilot.

Once the pilots are selected by the process described under the WP3 Open Calls, the responsible coordinator will organise an intake meeting with all the winners to welcome them and explain to them the onboarding process. At this point of time, we will also assign the mentors to the pilots and we will train the experts and the mentors, when required.

The Kick off event at the beginning of the mentoring program will allocate the full pool of mentors; explain the resources available and the procedures to be followed within the pilot program.

### 3.5 Monitoring process

Monitoring the execution of the different pilot projects during the deployment phase of the DS4SSCC-DEP project is essential. As included in Annex 2, a dashboard/overview of the monitoring is important because it helps the team to evaluate the effectiveness of the pilot project before deploying it on a larger scale. By monitoring the progress, performance, quality and timeline checks of the project, the support team can identify any issues or opportunities for improvement and plan changes accordingly.

During the monitoring period of the pilot projects also the mentors will work with the pilots to establish clear and measurable goals for their pilot projects. They provide assistance in tracking the progress.

To keep an overview for the support team and both mentors, annex 2 gives a timeline with most important milestones starting from the announcement of the open call until the final deployment of the pilot project. The mentors get a perspective of the overall deadlines, important communications, official feedback, selection and evaluation moments and the timing of their mentor targets to be reached during the different deployment stages of their pilot projects.

In the **minute template for mentors** (refer to [Public Info repository](#)) also the most essential timing regarding the mentoring is listed. In this template with 3 topics, the mentor can also take note of the reached KPI's, the detected risks or training needed and can write down some extra remarks if necessary.

Some pilot projects will start from a more mature starting situation/position than other projects which allows the mentors also to proceed faster in some cases through the timing than others.



The pilot performance indicators will need constant monitoring (at least on a monthly basis) during this timeline and in the template minutes mentor will be facilitating this process to standardise the track keeping over the projects.

The colour codes in annex 2 table indicate which type of milestone our communication is stated. All official deliverables and reports in dark orange; all official announcements/communication moments in light orange, all support and mentoring in green; all supportive and additional information in blue.

All timing except the official announcement or deadlines are suggested time targets but are not fixed or obligatory. They only serve as guidance for the mentors/mentees and the coordinating team.



## 4 Training program

To ensure a successful deployment and execution of DS4SSCC-DEP pilots, a comprehensive series of training activities has been planned.

The training is closely intertwined with the mentoring program (T4.2), as mentors will actively guide and monitor the mentees (the pilots). During the preparation phase of the training program, specific training packages will be defined, and relevant training materials will be prepared by experts. Identifying these experts among the partners before the pilots commence their training is crucial.

Attendance in these training programs is mandatory to acquire the necessary skills for executing the pilots.

### 4.1 Training needs

Data spaces for smart communities are a novel concept that aims to enable data sharing and collaboration among different stakeholders in urban and rural areas. However, the level of awareness and understanding of this concept varies across different groups, such as municipalities, citizens, businesses, and researchers. Based on the DS4SSCC preparatory action and work with the Stakeholder Forum, we identified the main stakeholder groups that will be involved in pilots and estimated their knowledge levels related to data spaces for smart communities. Further, in the development of trainings, we will address challenges and opportunities for increasing the capacity and readiness of these groups to participate in data spaces.

The main groups of stakeholders that will be involved in pilot deployments are either from representatives of local authorities (cities, regions, villages, NGOs) or from those organisations providing solutions for them (mainly companies, but also associations and research organisations). They have specific training needs based on their roles, as well as their expertise and level of knowledge.

- **Local Authorities - Decision Makers:** These individuals hold key positions within local government bodies or agencies. They are responsible for making strategic decisions related to policies, regulations, and resource allocation. Their focus is on governance, public service delivery, and overall management of the territory.
  - **Overall Knowledge:** Decision makers within local authorities have a solid understanding of data governance related to policy-making and city management. However, their specific knowledge about data spaces may be limited.
  - **Gap:** While decision makers are well-versed in traditional data governance, they lack familiarity with the concept of Data Spaces for Smart Communities. These gaps become more pronounced when considering the European vision for data-driven innovation and collaboration. Here, alignment with the European data space framework becomes essential.
  - **Training Needs:** Decision makers require an introduction to data spaces, emphasising their role in enabling data-driven decision-making, along with contextualization for smart communities. Real-world examples and case studies can illustrate the impact of data spaces on local governance and service delivery, empowering them to actively contribute to the European data ecosystem and drive innovation and prosperity .
- **Authorities - IT Experts:** These professionals work within local government IT departments. They specialise in technology infrastructure, systems, and applications. Their responsibilities



include maintaining and enhancing IT services, cybersecurity, data management, and digital transformation.

- **Overall Knowledge:** IT experts working for local authorities are well-versed in technology infrastructure, systems, and applications. However, their exposure to data spaces may be limited.
- **Gap:** They may not have specific knowledge about implementing data spaces tailored for smart communities. This includes understanding interoperability, security and trust and added value creation topics that are covered in the Blueprint for Data Spaces for Smart Communities.
- **Training Needs:** These IT experts need specialised training that covers the technical aspects of data spaces, including integration, security, and scalability within the context of smart cities.
- **Solution Providers - Business Developers:** These individuals represent companies or organisations that offer solutions, products, or services for local governments. They focus on understanding client needs, identifying business opportunities, and creating value propositions. Their main goal is to establish partnerships and drive business growth.
  - **Overall Knowledge:** Business developers from solution provider companies understand client needs, business opportunities, and value propositions. However, data spaces may be a novel concept for them.
  - **Gap:** They might lack awareness of how data spaces can enhance their solutions for smart communities and what is the potential impact on their business models, market positioning and sustainability.
  - **Training Needs:** These business developers require an introductory session on data spaces, focusing on their potential impact on business models, market positioning and sustainability.
- **Solution Providers - IT Experts:** These professionals work for solution provider companies. They specialise in technical aspects such as software development, system integration, and implementation. Their role is to design, develop, and deliver technology solutions to address specific challenges or requirements.
  - **Overall Knowledge:** IT experts within solution provider organisations excel in technical domains such as software development and system integration. However, data spaces may not be part of their existing expertise.
  - **Gap:** They may lack familiarity with the Blueprint for Data Spaces for Smart Communities, which is the core requirement for pilot delivery..
  - **Training Needs:** These IT experts need targeted training that delves into the intricacies of data space architecture, interoperability, and data governance within the context of smart city projects. Specifically, they must gain in-depth understanding of the Blueprint for Data Spaces for Smart Communities.

In summary, while each group brings valuable expertise, tailored training programs will bridge the knowledge gaps and empower them to leverage data spaces effectively in the deployment of smart community solutions.

Based on our assessment, Table 6 shows the proposed topics of the training packages and the knowledge level of a training based on the stakeholder profile involved in the pilot.

Table 6: Training needs

Training topic	Target group
----------------	--------------



	Local authorities - demand side		Solution providers - supply side	
	Decision makers	IT experts	Business developers	IT experts
Technical	basic	advanced	basic	advanced
Business	basic		advanced	
Governance and Legal	advanced	basic	basic	basic
Leveraging TEF & other infrastructure	basic	advanced		advanced

## 4.2 Training methods

The following training methods will be used throughout the pilot program:

- **eLearning:** Educational content will be delivered on-line. Learners will access materials at their own pace, making it flexible and convenient.
- **Classroom training:** Traditional instructor-led sessions. Participants will engage in face-to-face learning, discussions, and activities. Classroom training will be delivered mostly on-line, in a webinar format. When convenient, those training sessions may also be delivered in a classroom setting
- **Case studies and best practices from pilots:** Examples and scenarios from DS4SSCC-DEP pilots will be analysed to showcase best practices and underlying principles. These trainings will be developed for Batch 2 and Batch 3 of the pilots.

Training methods that could be used for the roles outlined in Table 6 are:

- Local authorities - Decision makers: As this role requires advanced knowledge in governance, and legal aspects, a combination of classroom training and case studies could be beneficial. Classroom training can provide in-depth information and allow for real-time Q&A, while case studies can provide practical examples of how to apply this knowledge. For the basic knowledge in business, eLearning could be a good fit as it allows for self-paced learning.
- Local authorities - IT experts: This role requires advanced knowledge in technical topics. A general classroom introduction about the technical blueprint and a provision of information about TEF and other infrastructure through eLearning will be provided.
- Solution providers - business developers: This role requires advanced knowledge in business models and sustainability. Classroom training and case studies could be useful here as they allow for the understanding of theoretical knowledge in connection with real-life examples. Basic knowledge in governance and legal aspects could be gained through eLearning.
- Solution providers - IT experts: This role requires advanced knowledge in technical topics. Therefore, in addition to a general classroom training, provision of detailed information about TEF and other infrastructure will be provided through eLearning (technical documentation, tutorials). Basic knowledge in governance and legal aspects could also be gained through eLearning.

## 4.3 Training packages

Standard training packages with training materials will be prepared in order for the pilots to gain the required skills for executing the pilots. The packages will be prepared for technical, business and governance topics for different roles - decision makers, service/solution providers. The starting point



to prepare the packages are the building blocks that were defined by the Data Spaces Support Center (DSSC). The training packages will build further on the results of the DS4SSCC preparatory action such as a catalogue of building blocks specifications, a reference architecture, etc.

Training packages must address the needs of a very diverse group of learners who will work on the pilot execution. It is envisioned that the learners are already employed therefore have limited time for learning, meaning that an efficient combination of mentoring and training is essential.

A training package must be specific for a certain context and target group(s) as described in Training needs and Training methods sections.

Figure 5 illustrates the training packages that will be delivered for each pilot project.

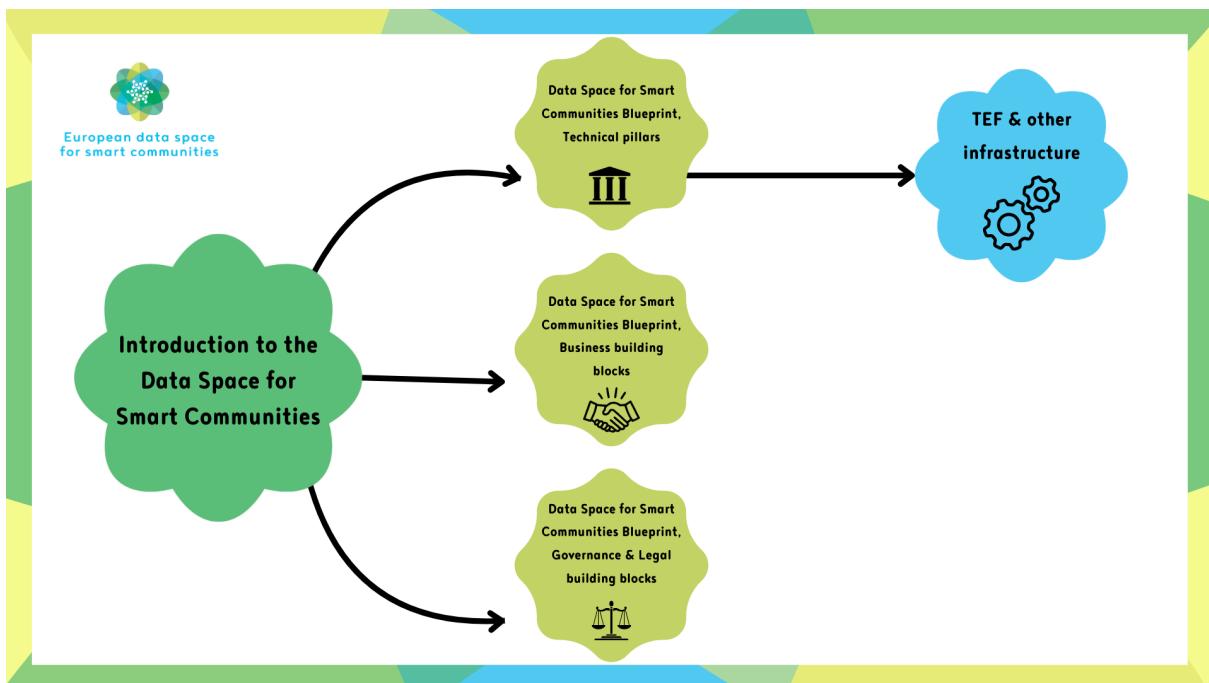


Figure 5: Training packages

Overview of the training packages:

- **Introduction to the Data Space for Smart Communities:** This foundational training provides an overview of data spaces and their significance in the context of smart communities. Participants will learn about the core concepts, benefits, and potential applications of data spaces.
  - Target Audience: All stakeholders, including decision makers, IT experts, and solution providers.
  - Key Topics: Understanding data space fundamentals, use cases, benefits and relevance to smart community development.
- **Data Space for Smart Communities Blueprint - Technical Pillars:** This training delves into the technical aspects of data spaces. Participants will explore the architecture, interoperability, security, scalability and data value considerations specific to smart community data spaces.
  - Target Audience: IT experts, solution providers, and technical teams.



- Key Topics: Data integration, interoperability, MIMs, APIs, data governance and data privacy.
- **Data Space for Smart Communities Blueprint - Business Building Blocks:** Focusing on business perspectives, this training covers how data spaces can create value for businesses operating in smart communities. Participants will learn about monetization strategies, ecosystem collaboration, and business models.
  - Target Audience: Business developers, solution providers, and entrepreneurs.
  - Key Topics: Business opportunities, revenue models, data monetization, and market positioning.
- **Data Space for Smart Communities Blueprint - Governance & Legal Building Blocks:** This training addresses the legal and governance aspects of data spaces. Participants will gain insights into regulatory frameworks, data ownership, consent management, and compliance.
  - Target Audience: Decision makers, legal experts, and policymakers.
  - Key Topics: Legal considerations, data sharing agreements, privacy regulations, and ethical guidelines.
- **TEF and other Infrastructure:** Focusing on technical infrastructure, this training explores the **Testing and Experimentation Facility (TEF)** and other infrastructure that will be made available to pilots. Participants will understand what are the services provided by TEFs and other initiatives.
  - Target Audience: IT experts, technical architects, and infrastructure specialists.
  - Key Topics: TEF principles, infrastructure setup, data storage, and network connectivity.

These training packages aim to equip participants with the necessary knowledge and skills to actively participate in the deployment of data spaces for smart communities.

#### 4.4 Delivery of trainings

The training sessions for the DS4SSCC-DEP pilots will be organised to ensure flexibility and adaptability for the piloting organisations. The delivery methods will be tailored based on the specific roles of individuals, as outlined in the training method chapter. During the onboarding process, the proposed training activities' schedule for each pilot will be further refined.

The identification of existing training materials, design and delivery of new ones will be a collaborative and iterative effort involving key partners. WP4 partners will collectively contribute to shaping the training content. By leveraging their expertise, these partners will ensure that the materials align with the project's goals and address the unique requirements of smart community data spaces.

To enhance the effectiveness of the training, the Mentor Program Coordinator together with the mentors will assess the needs of the selected pilots. Understanding their specific requirements and skill gaps will allow us to plan the training content accordingly.

Upon successful completion of the training, participants in the pilots will receive certificates. These certificates will recognize their acquisition of relevant experience and skills necessary to achieve the pilot objectives.

This approach aims to foster collaboration, knowledge sharing, and skill development among all stakeholders involved in the DS4SSCC-DEP initiative.



## 4.5 Evolution of training material and learning experience

Gathering feedback from trainees is a cornerstone for a successful training program. It provides essential insights into both the quality of training materials and the effectiveness of delivery. In this chapter, we propose an optimal approach for distributing evaluation questionnaires.

The questionnaire aims to gather trainees' feedback on various aspects of the training program. Trainees are asked to rate elements such as the clarity of learning outcomes, their interest in the topic, the balance of workload, and the effectiveness of teaching methods. Additionally, the questionnaire explores overall satisfaction and alignment with expectations. By actively seeking trainees' input, the training program can continuously evolve and enhance the learning experience.

The timing of questionnaire distribution significantly impacts the quality of responses. For this reason, we will implement the following approach:

- End of Training: Distribute evaluation questionnaires towards the end of the training session (end of live classes or self-learning materials). By this point, trainees have engaged with the material, experienced the methods, and can provide thoughtful feedback.
- Informed Trainees: Prior to the training, we will inform participants that they will be asked to evaluate the training materials. Transparency encourages active participation.
- Classroom Integration: We will reserve a few minutes during the training session to complete the questionnaires. This ensures higher response rates and provides an opportunity for immediate discussion.

To leverage the value of the collected feedback, the following steps will be taken:

- Prompt Analysis: Review the responses promptly. Identify trends, common themes, and actionable insights.
- Material Refinement: Use feedback to update training materials. Correct errors, clarify concepts, and enhance relevance.
- Trainee Engagement: Share the aggregated results with trainees. Discuss improvements made based on their feedback. This reinforces the collaborative learning process.



## 5 Pilots and evaluation assessment

All the running pilots under the European Data Space for Smart Communities are required to be supported (as described in Section 2), monitored (as described in Section 3), trained (as described in Section 4) and evaluated with regards to certain indicators as it is described in this section.

### 5.1 Purpose of the evaluation

The evaluation to be conducted across the pilots has two objectives:

- **Assess the performance of the pilots** towards a set of indicators to show the evolution of their status from the beginning (benchmark) to the end. Through the three assessments of the proposed indicators (at starting, mid-term and at the end of the pilot), the mentor can verify the progress of the pilot, identify potential issues and drawbacks, define contingency measures with the pilot owners and escalate to the WP4 leader in case of stoppers' detection.
- **Obtain relevant feedback** about their validation of the blueprint to adapt it accordingly. This feedback is of great importance for the WP2 which is in charge of upgrading and adapting the current blueprint to the real application scenarios.

### 5.2 Evaluation process

The evaluation of the pilots will be carried out at mid-term and at the end of the pilot execution. In order to establish the reference values for benchmarking, the project has to evaluate the pilot at the beginning of the execution and gather the baseline values where each of them starts from.

Figure 6 shows the three milestones and actions to carry out in each of the steps for the evaluation process.



Figure 6: Evaluation process



### 5.3 Indicators (Key Performance Indicators)

The project has defined a set of key performance indicators to support the monitoring and assessment of the pilots. The indicators have been decided under the basis of fostering the evolution of the pilots and the target values have been set up to prevent the access barrier but to the minimal value required to validate the principles of the data space principle (e.g. to share data between two participants; at least two data providers are needed in each pilot; at least one service needs to be provided based on the shared data; at least one data user is needed in each pilot).

Table 8 lists the different categories of identified indicators, codified and with the related work packages and the minimal target value to overcome the evaluation assessment. These indicators will be provided to the applicants to the open call to allow them knowing what they will be measured about during the pilot's execution. The indicators are as most quantitative as possible, and a poor evaluation may affect the payment schema of the funding tranches.

Table 8: Performance indicators for pilots evaluation

Category	Code	Indicator	Related WPs	Target value (minimal)
Governance	IG1	number of data providers	WP4	2
Governance	IG2	number of data users	WP4	1
Governance	IG3	number of participants	WP4	3
Governance	IG3	number of contracts (new data provider)	WP4	1
Governance	IG4	participation in Stakeholder Forum meetings	WP2	all organised during the execution
Governance	IG5	number of engagement of eDIHs	WP2	1
Impact	II1	number of events	WP5	1
Impact	II2	number of diss actions (articles, posts, etc)	WP5	3
Impact	II3	higher score in Lordimas	WP5	increment of 10% in the score
Management	IM1	ethics readiness	WP5	High
Management	IM2	% deviation of budget spent	WP3	10%
Management	IM3	% ethical issues solved	WP5	100%
Support	IS1	number of support requests (Jira)	WP4	12
Support	IS2	number of training packages	WP4	4
Technical	IT1	number of datasets provided to other participants (shared)	WP2	2
Technical	IT2	number of reusable services	WP2	1
Technical	IT3	number of data sources	WP2	2
Technical	IT4	number of datasets reused from other participants (used)	WP2	2
Technical	IT5	% infrastructure reused from TEEF	WP2	50%
Technical	IT6	number of AI services available	WP2	1



Technical	IT7	number of datasets shared outside of the domain	WP2	1
Technical	IT8	number of implemented MIMs	WP2	2
Technical	IT9	number of new developed applications	WP2	1
Technical	IT10	number of building blocks used	WP2	all essential
Technical	IT11	number of validated components from the blueprint	WP2	3
Technical	IT12	number of open standards used	WP2	1 per used BB

This initial list of 26 indicators could be extended with some additional as a result of the collected feedback from pilots about the monitoring and evaluation process. They have been categorised into Governance, Impact, Management, Support and Technical depending on the addressed aspect by each one. A code has been assigned to refer to them in a shorter manner. Every indicator is affecting different WPs, attending also to its category. The referred WPs will use the obtained values for their own analysis and assessment. The target value represents the minimal goal for each pilot to reach at the end of the execution. In most cases, the indicator has a quantitative target value in favour of objectivity and measurability.

The presented list of indicators are required for the assessment of the pilots' performance, but through the interaction of the mentor with the pilots, other additional indicators will be gathered from them. WP5 is working on a set of indicators to measure the impact of the data space as a whole, and the inputs from the pilots are vital for this assessment. Therefore, this list of indicators will be complemented by an additional one that will be processed by WP5.

## 5.4 Evaluation tools

The evaluation will be conducted by the mentor according to the pilot plan defined in agreement with the pilot. The three planned **evaluation's interviews** (starting, mid-term and final) will be set up by the mentor. During them, the mentor can gather the status and progress of the pilot informally through a friendly conversation. The mentor can make use of the template of the progress minutes (to be used in all meetings with the pilot) to register the progress.

Additionally, the pilot needs to fulfil a **self-assessment survey** with qualitative and quantitative questions about:

- the current values of the above referred indicators,
- the main issues encountered during the period,
- the main challenges for the next period,
- feedback about the different elements of the blueprint,
- valoration of the received support from the experts,
- valoration of the received mentoring by the mentor,
- open questions/opinions.

This survey will be provided online using the EU Survey tool and the pilots will have 2 weeks at most to fulfil it. The results will be analysed to come up with the overall status of the pilot which will confirm its evolution or not; and with the collected feedback about the blueprint which will be transferred to WP2 for the evolution of the blueprint.



Finally, the project team maintains a central dashboard (**Project KPIs framework**) with all indicators used in the project, either for the pilots performance, for the impact assessment and for reporting as included in the contract. Having this common framework for all KPIs, a consolidated view is provided to the project team and also favour the alignment towards the pilots, requesting them the required information through an unique channel and only once.



## 6 Conclusions and next steps

This document has presented the planned activities by the support team in the DS4SSCC-DEP project to facilitate the onboarding in the European Data Space for Smart Communities and execution of the pilots selected by the call for pilots. Therefore, it includes the onboarding process, the monitoring plan, the training activities and the evaluation framework to assess their performance and gather the feedback about the blueprint.

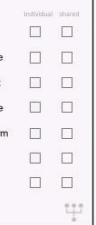
The support team will be formed by mentors who will be monitoring the pilots and acting as the entry point to the data space; experts in specific areas about data spaces and trainers for different learning packages. The support activities will follow the milestones defined by the call for pilots procedure. Since the pilots are awarded in any of the rounds of the open call, the support team (under the umbrella of the WP4) will be providing them with all the necessary elements to do their project in the best possible way. Thus, a mentor will be assigned already during the contract phase to accompany them from the very beginning. An onboarding workshop with all the winning pilots in each round is organised to welcome them to the data space and provide a smooth landing. After that, each mentor organises an individual meeting with her pilot to detail the working plan, agree on the monitoring program and profile the pilot at starting time. The mentor will be supported by the experts in different topics for the continuous support to the pilot. In every evaluation, the mentor will assess the status of the indicators to verify the evolution of the pilot, collecting as well the feedback about the blueprint valuable for its evolution.

The above described plans will be updated during the project according to the feedback provided by the pilots about the process and activities and based on the lessons learned from one round of pilots to the next one. The WP4 will deliver two reports (D4.2 at M18 and D4.3 at M36) about the carried out activities, the status of the pilots and the gained experience from each round. All the training material will be compiled in a unique deliverable (D4.4) at the end of the project for future reference. After the submission of the deliverable, the support team will start to prepare the onboarding package, the training packages and the self-assessment survey in order to be ready for the first round of pilots starting in September 2024.



## Annex 1: Pilot profile

### Pilot profile

Data Cooperation Canvas	Organizational			Why?			Technical		
	<b>Key partners</b> Who are the partners involved in the data exchange? What are their roles?	<b>Shared processes</b> What steps are performed as a shared process in the data exchange? What steps are done individually?	<b>Context</b> What is the business context that creates the opportunity/necessity for data exchange?	<b>Data &amp; data sources</b> What data is exchanged? What are the data sources used?					
	<b>Resources</b> What organizational resources are required for this data cooperation? What resources are available already? What needs to be done to get all required resources?		<b>Added value</b> Why will this data cooperation succeed? What is the added value for participants?	<b>Interoperability</b> How can the data be uniformed/standardized/combined? What shared concepts, languages, formats, or methods can be used? Is it hard to combine all the data? Or are standard definitions available? What data standards or formats are used or need to be used?					
	<b>Business case</b> Why are the costs of the data exchange? Who is paying? What are the revenues? Who is profiting? What compensation, fees or other financials are needed?		<b>Motivation &amp; objectives</b> What is the motivation for the key partners to join the data exchange? What are their main objectives of participating?	<b>Technical concepts/models</b> What technical concepts or models need to be in place for the data exchange. What MIMs are implemented and how are they implemented?	<b>Technical infrastructure characteristics</b> What technical infrastructure is needed for the data exchange?				
	<b>Governance model</b> How are rules, norms and actions structured/sustained/regulated to control the data exchange?		<b>Implementation roadmap</b> What approach will be used for realizing and implementing the data exchange?						

Impact	Data Spaces Governance			Data Value Creation			Technical Infrastructure		
	Transition to non profit organizations	Service Level Agreements #of datasources covered by contracts		Architecture fully working as an operational system					
	Additional Use Cases defined	Data Infrastructure is able to connect new sources		Full architecture defined and tested					
	Data cooperation canvas agreed upon	Data exchange is up and running #partners actively exchanging data		MVP tested as an operational system					
	Necessary components working	First data sources connected #datasets as a percentage of goal		MVP defined and agreed upon					
	Pilot network defined	Data management plan established		Requirements defined					

Building Blocks (DSSC)	Organisational						Technical					
	Business		Governance		Legal		Data Interoperability		Sovereignty & Trust		Data Value Creation	
	Business Model Development		Organizational form & Governance authority		Regulatory compliance		Data Models		Access & usage policies enforcement		Data, Services and Offerings description	
	Use Case Development		Participation management		Contractual framework		Data Exchange		Identity and Attestation Management		Publication & Discovery	
	Data Product Development						Provenance & Traceability		Trust framework		Value Added Services	
	Data Space Intermediary											



## Annex 2: Milestones monitoring overview

Responsible	Item/Task/Target		Timing	Frequency	Remarks
WP3	<b>open call 1 announcement</b>		17/1/2024		
	<b>Stakeholder forum open call 1</b>		Feb-March 2024		
WP3	<b>Deliverable (D3.1)</b>		29/2/2024		
WP4	<b>WP4: D4.1</b>		29/2/2024		
WP3	<b>official open call launch/application period starts wave <u>launch 1</u></b>		11/3/2024		
<b>APPLICATION PERIOD LAUNCH 1: March- May 24</b>					
WP3	Open Call 2 Announcement		May 2024		
WP3	<b>Stakeholder forum open call 2</b>		May-June 2024		
WP3/WP4	<b>Evaluation and selection period by expert jury launch 1</b>		June-July 2024		
WP3	<b>Official Open Call 2 Launch/ application period starts wave <u>launch 2</u></b>		June 2024		
<b>APPLICATION PERIOD LAUNCH 2: June-August 24</b>					
WP3/WP4	notification of selected pilot projects launch 1		August 2024		
WP3	Feedback to pilot teams and re-submission of re-scope proposal		August-Sept 2024		
WP3	<b>Open Call 3 Announcement</b>		September 2024		
WP3	<b>Stakeholder forum open call 3</b>		Sept-Oct 2024		
WP3/WP4	<b>Evaluation and selection period by expert jury launch 2</b>		Sept- Oct 2024		
<b>APPLICATION PERIOD LAUNCH 3: October- November 2024</b>					
WP4/WP3	onboarding workshop projects launch 1		September 2024	implementation period until sept 25	
WP4: FIWARE	support helpdesk starts launch 1 projects		September 2024		
MPM and mentors and pilots	<b>The Kick off event</b> launch at the beginning of the mentoring Program will allocate the full pool of mentors;		Sept 2024 start pilot deployment		
WP3	<b>Official Open Call 3 Launch/application period starts wave <u>launch 3</u></b>		October 2024		
MPM and mentors	meeting startup mentoring guidelines and approach		October 2024		
<b>IMPLEMENTATION PERIOD 1 (12-16M: October 24-September 25/Jan 26)</b>					



mentors /experts	agreed mentoring plan T4.2		October 2024		
<b>mentoring and monitoring starts Launch 1 pilots: October 24-September 25/January 26</b>					
mentor and pilot	Launch 1 pilots <b>Explore:</b> identify the challenges or opportunities that the organisation aims to address through the creation of a data space, and to generate and mobilise ideas for potential solutions: use the data canvas model and innovatrix tool as guidance (mentoring target 1)		October 2024		
WP3	Notification of selected projects launch 2		November 2024		
WP3	Feedback to pilot teams and re-submission of re-scoped proposal of launch 2		Nov-Dec 2024		
WP4/WP3	On-boarding workshops launch 2 pilot projects		December 2024	implementation period December 24 until November 25	
<b>IMPLEMENTATION PERIOD 2 (12-16M: January 25-Dec 25/April 26)</b>					
WP4/FIWARE	support helpdesk starts launch 2 projects		December 2024		
mentor and pilot	Launch 1 pilot projects <b>Validate:</b> evaluate and select the most promising and feasible ideas for the data space, and to test them with customers and stakeholders (mentoring target 2)		December 2024		
<b>MENTORING AND MONITORING STARTS-LAUNCH 2 pilots: December 24 until November 25/April 26</b>					
WP3	Evaluation and selection period by expert jury launch 3		Dec 24-Jan 25		
mentor and pilot	Launch 2 pilot projects <b>Explore:</b> identify the challenges or opportunities that the organisation aims to address through the creation of a data space, and to generate and mobilise ideas for potential solutions: use the data canvas model and innovatrix tool as guidance (mentoring target 1)		December 2024		



WP3/WP4	D3.3 Ranking and selection of Pilots		January 2025		
WP3	Notification of selected projects launch 3		February 2025		
WP3	Feedback to pilot teams launch 3 and re-submission of re-scoped proposal		Feb-March 2025		
mentor and pilot	<u>Launch 2 pilot projects</u> <b>Validate:</b> evaluate and select the most promising and feasible ideas for the data space, and to test them with customers and stakeholders (mentoring target 2)		Feb/March 2025		
mentor and pilot	<u>Launch 1 pilot projects</u> <b>Define:</b> Define and optimise the selected ideas for the data space, and to develop a detailed and comprehensive plan for the implementation(mentoring target 3)		Feb/March 2025		
WP3/WP4	On-boarding workshops launch 3 pilot projects		March 2025	implementation April25-March/May 26	
all WP4	<b>report D 4.2 (M18): Pilots interim report</b>		March 2025		
<b>IMPLEMENTATION PERIOD 3 (12-14M: April 2025-March 26/May 2026)</b>					
FIWARE/WP4	support helpdesk starts launch 3 projects		April 2025		
<b>MENTORING AND MONITORING STARTS- Launch 3 pilots 12-14M: April 2025-March 26/May 26</b>					
mentor and pilot	<u>Launch 3 pilot projects</u> <b>Explore:</b> identify the challenges or opportunities that the organisation aims to address through the creation of a data space, and to generate and mobilise ideas for potential solutions: use the data canvas model and innovatrix tool as guidance (mentoring target 1)		April 2025		
mentor and pilot	<u>Launch 2 pilot projects</u> <b>Define:</b> Define and optimise the selected ideas for the data space, and to develop a detailed and comprehensive plan for the implementation(mentoring target 3)		April/May 2025		



mentor and pilot	<u>Launch 1 pilot projects</u> <b>Implement:</b> execute and monitor the project plan, and launch and evaluate the data space (mentoring target 4)		April-Sept/Dec 2025		
mentor and pilot	<u>Launch 3 pilot projects</u> <b>Validate:</b> evaluate and select the most promising and feasible ideas for the data space, and to test them with customers and stakeholders (mentoring target 2)		May/June 2025		
mentor and pilot	<u>Launch 2 pilot projects</u> <b>Implement:</b> execute and monitor the project plan, and launch and evaluate the data space (mentoring target 4)		June/July 2025		
mentor and pilot	<u>Launch 3 pilot projects</u> <b>Define:</b> Define and optimise the selected ideas for the data space, and to develop a detailed and comprehensive plan for the implementation(mentoring target 3)		July/August 2025		
mentor and pilot	<u>Launch 3 pilot projects</u> <b>Implement:</b> execute and monitor the project plan, and launch and evaluate the data space (mentoring target 4)		Sept/Oct 2025		
all tasks	<b>REPORT D4.3 (M36)</b>		Sept 2026		
<b>REPEATED ACTIONS</b>					
mentor	Regular Sync up with pilot contact <b>Launch 1 pilot projects</b>		from Sept 2024 to sept 2025	bi-weekly	
mentor	Regular Sync up with pilot contact <b>Launch 2 pilots</b>		December 2024 until November 2025	bi-weekly	
mentor	Regular Sync up with pilot contact <b>Launch 3 pilots</b>		March 2025-Feb 2026	bi-weekly	
mentor	Regular internal sync – A sync between the pilot mentors and pool of experts		from Sept 2024 to Feb 2026?	Monthly	



mentor	Notes/summary of challenges and learnings for deliverable – pilot mentors will maintain a record of challenges faced and learnings for each pilot they are mentoring which in the end is aggregated into the deliverable(s) for this WP4		from Sept 2024 to feb 2026?		
MPC and mentors	pilot peer learning event: focus on creating links and finding synergies across the pilots		mid project deployment: M17/18 Feb/March 25		
MPC	Regular internal sync – A sync between the pilot mentors and MPC		during 3 launches	bi-weekly	
MPC	Regular internal sync – A sync between the responsibles training (CCIS) and MPC and WP4 leader		during 3 launches		
MPC	Regular internal sync – A sync between the responsibles helpdesk (FIWARE) and MPC and WP4 leader		during 3 launches		
MPC en mentors	closing event:final feedback collected				
mentor and pilot	co-creation exercise (data cooperation canvas) for engaging stakeholder in order to map -there needs -facilities, technical and data resources -help the pilots to understand their business case (mentoring target 5)		During implementation		



## About the European Data Space for Smart Communities

The European Data Space for Smart Communities (DS4SSCC-DEP) initiative is a pivotal deployment following the preparatory action for a Data Space for Sustainable and Smart Cities and Communities (DS4SSCC). The preparatory action for a Data Space for Sustainable and Smart Cities and Communities (DS4SSCC) laid the foundation for DS4SSCC-DEP. Emphasising sustainability aspects and diversity in communities, DS4SSCC developed a multi-stakeholder data governance scheme, created a blueprint for the European DS4SSCC, delivered priority datasets, developed a roadmap towards a mature DS4SSCC, and implemented the data space on various governance levels.

DS4SSCC-DEP's vision revolves around creating a well-governed data space available for developers and infrastructure providers, aligning with the prospects outlined in Europe's Digital Decade objectives. Our vision is rooted in acknowledging data as a critical asset in contemporary society, akin to essential resources like water or food supplies. DS4SSCC-DEP aims to build a territorial, place-based data space for smart communities. This approach distinguishes itself from sectorial data spaces by encompassing diverse domains, underpinning governance across all levels of society. The key objectives of the project are:

- **Objective 1: Establishing a Federated and Innovative Data Space.** This phase focuses on creating a large-scale data space controlled by public data holders, ensuring alignment with the Smart Middleware Platform and broader data space ecosystems. It also aims to offer middleware service solutions facilitating data sharing and management while refining the blueprint based on gained experience.
- **Objective 2: Pilots and Refinement of the Data Space Blueprint.** Through 10-12 cross-sector data pilots in various EU communities, this objective aims to validate and refine the data space blueprint. Using common high-value data sets, it seeks to create added value by combining data from various domains, contributing to the sustainability plan, and minimising infrastructure investment.
- **Objective 3: Fostering Innovation and Ecosystem Alignment.** Engaging stakeholders, compliance with sector-specific legislation, establishing links with Horizon Europe missions, creating services available via trusted application catalogues, and enhancing ethical considerations and AI-enabled local solutions constitute the focus of this objective.

DS4SSCC-DEP, building upon established European networks, aims to significantly contribute to the sustainability goals of European citizens. It emphasises co-creation, standardisation, business models, strategies for data spaces, and envisions a federated platform.

### Our consortium:

		 <small>FinEst Centre for Smart Cities</small>	 <small>Chamber of Commerce and Industry of Slovenia</small>



DATA SPACE FOR  
SMART AND SUSTAINABLE  
CITIES AND COMMUNITIES

## Deliverable D2.2

# Multi-Stakeholder Governance Scheme

WP 2– Governance

**Author:** Justine Gangneux (Eurocities)

**Reviewers:** Sophie Meszaros (OASC), Clara Pezuela (Fiware Foundation), Charline Feurtey (Eurocities), Federica Bordelot (Eurocities), Martin Brynskov (OASC)

**Delivery date:** 26/09/2023

**Dissemination level:** Public

**Type:** Report



Funded by  
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or of the granting authority. Neither the European Union nor the granting authority can be held responsible for them.



## Revision History

Author Name, Partner short name	Description	Date
Justine Gangneux (Eurocities)	Version 1	31/08/2023
Sophie Meszaros (OASC)	Review 1	06/09/2023
Charline Feurtey (Eurocities)	Review 2	08/09/2023
Federica Bordelot (Eurocities)	Review 3	20/09/2023
Clara Pezuela (Fiware)	Review 4	24/09/2023
Sophie Meszaros (OASC)	Final review	24/09/2023
Martin Brynskov (OASC)	Final review	24/09/2023
Justine Gangneux (Eurocities)	Final version	26/09/2023

## Abbreviations

APIs	Application programming Interfaces
B2B	Business-to-Business
B2C	Business-to-Consumer
B2G	Business-to-Government
CDO	Chief Data Officer
CTO	Chief Technology Officer
DaaS	Data-As-A-Service
DPIA	Data Protection Impact Assessment
DPO	Data protection Officer
DS	Data Space
DS4SSCC	Data Space for Smart and Sustainable Cities and Communities
DSSC	Data Spaces Support Centre
DGA	Data Governance Act
EDIB	European Data Innovation Board
EDPB	European Data Protection Board
EDPS	European Data Protection Supervisor
eIDAS	electronic IDentification, Authentication and Trust Services
EIF	European Interoperability Framework
FAIR	Findable, Accessible, Interoperable and Reusable
GDPR	General Data Protection Regulation
IDEA	Intelligent Data Exchange Alliance
IDSA	International Data Spaces Association
IPRs	Intellectual Property Rights
LDES	Linked Data Event Streams
LDT	Local Digital Twin
MIMs	Minimal Interoperability Mechanisms
NAP Core	National Access Point Coordination Organisation for Europe
NDA	Non-Disclosure Agreement
OSLO	Open Standards for Linked Organisations
PETs	Privacy-Enhancing Technologies
PPP	Public Private Partnerships
SLA	Service Level Agreement
SaaS	Software-As-A-Service



## Table of Contents

<b>Revision History</b>	<b>2</b>
<b>Abbreviations</b>	<b>2</b>
<b>List of Tables</b>	<b>4</b>
<b>List of Figures</b>	<b>4</b>
<b>Acknowledgements</b>	<b>5</b>
<b>Executive Summary</b>	<b>6</b>
<b>1. Introduction</b>	<b>7</b>
<b>1.1. Multi-stakeholder governance scheme</b>	<b>9</b>
1.1.1. Scope of the scheme .....	10
1.1.2. Selection of use-cases .....	12
1.1.3. Overview of use-cases .....	13
<b>1.2 Contextual background</b>	<b>16</b>
1.2.1. Local data ecosystems and sharing .....	16
1.2.2. Challenges & opportunities .....	19
<b>2. DS4SSCC Code of Conduct</b>	<b>21</b>
<b>2.1. Vision &amp; Principles</b>	<b>21</b>
<b>2.2. Roles</b>	<b>23</b>
<b>2.3. Responsibilities</b>	<b>25</b>
<b>2.4. Governance framework</b>	<b>30</b>
<b>2.5 Legal frameworks</b>	<b>33</b>
2.5.1. Regulatory ecosystem .....	33
2.5.2. Contractual agreements .....	39
<b>3. Developing Multi-Stakeholder Data Cooperations</b>	<b>40</b>
<b>3.1. The Data Cooperation Canvas</b>	<b>40</b>
<b>3.2. Filling the canvas</b>	<b>42</b>
3.2.1. Define objectives & identify value proposition .....	42
3.2.2. Identify key partners & roles .....	47
3.2.3. Identify data types & sources .....	49
3.2.4. Define shared data flows .....	52
3.2.5. Identify resources required .....	54
3.2.6. Choose an appropriate model for the cooperation .....	55
3.2.7. Choose appropriate contractual agreements .....	61
3.2.8. Sustaining the cooperation over time .....	61
<b>4. Recommendations</b>	<b>64</b>
4.1 At the local ecosystem level .....	64
4.2 At the national level .....	65
4.3 At the European level .....	65
<b>5. Conclusions and next steps</b>	<b>67</b>
<b>6. References</b>	<b>68</b>



## List of Tables

Table 1: DS4SSCC stakeholders .....	9
Table 2: Selection criteria for WP2 use-cases.....	13
Table 3: Overview of WP2 use-cases .....	15
Table 4: Principles for DS4SSCC.....	22
Table 5: DS4SSCC Roles .....	24
Table 6: DS4SSCC roles and associated responsibilities .....	27
Table 7: Governance bodies .....	31
Table 8: Types of actions and governance and relevant bodies .....	32
Table 9: EU cross-sectorial legislation related to non-personal and personal data ..	34
Table 10: DGA provision for data intermediaries and altruism organisations .....	36
Table 11: Other relevant EU cross-sectorial regulations .....	37
Table 12: Possible contractual relationships in DS4SSCC.....	39
Table 13: Data Cooperation Canvas- Guiding Questions.....	41
Table 14: Context, Objectives and Value Propositions of WP2 Use-Cases .....	44
Table 15: Incentives per type of stakeholders .....	46
Table 16: WP2 Use-cases partners & stakeholders.....	48
Table 17: Template mapping initial partners & roles .....	48
Table 18: Dataset profile .....	50
Table 19: WP2 Use-cases datasets .....	51
Table 20: Template identifying resources.....	54
Table 21: Overview of data cooperation models .....	55
Table 22: Detailed overview of cooperation models .....	57
Table 23: Advantages & Risks of different cooperation models .....	59
Table 24: WP2 Use-cases cooperation models .....	60
Table 25: Types of revenue streams .....	63

## List of Figures

Figure 1: DS4SSCC Blueprint .....	11
Figure 2: Existing experience in Governance Group .....	12
Figure 3: City data ecosystems .....	17
Figure 4: DS4SSCC Principles.....	21
Figure 5: FAIR Principles .....	23
Figure 6: DS4SSCC Stakeholders and associated roles.....	28
Figure 7: Possible structure for DS4SSCC governance .....	29
Figure 8: Different levels of governance .....	30
Figure 9: Overview of European Strategy for Data.....	33
Figure 10: Concept of neutrality, DGA.....	35
Figure 11: Data Cooperation Canvas .....	43
Figure 12: The personal, private and public domains of data.....	49
Figure 13: Typical data flows processes .....	52
Figure 14: Shared processes in cooperation .....	53
Figure 15: Data sharing clauses – Zaragoza.....	61



## Acknowledgements

This work would not have been possible without the dedication and input of the representatives of local authorities who took part and contributed to the WP2 Governance Group. I would like to thank city representatives in Amsterdam, Lisbon, Barcelona, and Rubi who presented insightful use-cases for WP2 as well as representatives in Eindhoven, Helsinki, Porto, Région Centre-Val de Loire, Riga, and Zaragoza who provided further input and examples to nourish the scheme. I am also grateful to all stakeholders who took part in the project's events and provided input and feedback on the scheme. Finally, I would also like to thank Ron van der Lans and Jasper Soetendal from Braxwell.com (as external experts' strategic data partnerships of the City of Amsterdam's Directorate Digitalization & Innovation) for their valuable work on the Data Cooperation Canvas.



## Executive Summary

This document sets out the **multi-stakeholder governance scheme** for the Data Space for Smart and Sustainable Cities and Communities (DS4SSCC) developed in collaboration with local authority representatives and broader stakeholders (i.e. private sector, academia, civil society organisations) as part of work package 2 led by Eurocities.

The multi-stakeholder governance scheme aims to provide a **baseline modality** for data access and exchange in the deployment phase of DS4SSCC and facilitate the development of trustworthy local data ecosystems which align with European values. It is also a basis to support the future progressive harmonisation of local data ecosystems into a federated European data space for smart communities.

This document is aimed at **local data ecosystem stakeholders** in the public (cities, municipalities, regions) and private (SMEs, Start-ups, IT industry) sectors as well as stakeholders in the scientific community and civil society organisations who would like to set up and/or take part in multi-stakeholder data cooperation in line with the Data Space for Smart and Sustainable Cities and Communities.

This document is structured in three main sections. The first part iterates the first version of the **DS4SSCC Code of Conduct** which includes the principles and vision of the data space for smart communities, details the roles and responsibilities of participants, proposes governance structures, and reviews the legal and contractual frameworks relevant to DS4SSCC data sharing. The second section of the deliverable follows the framework of the **Data Cooperation Canvas** (Figure 11) and provides a **step-by step guide** to developing and sustaining multi-stakeholder collaborations that align with DS4SSCC. The canvas was co-developed during the preparatory action and cuts across all the work packages. The last part puts forward **recommendations** at the local, national, and European levels to foster trustworthy multi-stakeholder data cooperation.

The multi-stakeholder governance scheme is accompanied by appendices providing a **toolbox** with a range of relevant resources for data sharing, a **detailed overview of each WP2 use-cases** and a **summary of the methodology underlying the development of the multi-stakeholder governance scheme**.

The scheme is one component of the **blueprint for DS4SSCC** which also offers guidance on technical specifications and data standards (D3.1), sets up a reference architecture (D.3.2) as well as identifies priority datasets (D4.1) and provides a roadmap for the implementation of the data space at European level (D4.2). The blueprint will be further developed and validated during the **deployment phase** of DS4SSCC in the context of local pilots.



## 1. Introduction

DS4SSCC is a Coordination and Support Action under the umbrella of the [Living-in.EU](#) movement and aligns with its principles and values: citizen-centricity, a city-led approach at EU level, the city as a citizen-driven and open innovation ecosystem, ethical and socially responsible access, use, sharing and management of data, technologies as key enablers and the deployment of interoperable ecosystems based on open standards and technical specifications, Application Programming Interfaces (APIs) and shared data models.

DS4SSCC is envisioned as a **cross-sectoral horizontal data space** which will enable the [European Green Deal](#). It is grounded in local communities and authorities which are in a unique position to tackle climate change. Driven by the ambitious [EU Mission: Climate-Neutral and Smart Cities](#), European municipalities are taking the lead to reach climate neutrality by 2050 and pioneer innovative approaches with citizens and stakeholders<sup>1</sup>. Initiatives range from energy efficient buildings and retrofitting<sup>2 3</sup>, low carbon public transport<sup>4</sup> and encouraging active and sustainable mobility<sup>5</sup>, to green urban spaces to reduces CO2 emissions, increase air quality and fight against heat islands<sup>6</sup> while community led actions and citizen engagement (e.g., Citizen Assemblies, green participatory budgeting, citizen science) have also been growing<sup>7 8</sup>. In terms of data, local authorities and communities can both be providers and users of data and related services while bringing their local knowledge and experience. In the past years, numerous local data initiatives aimed at tackling climate change have emerged across domains such as [urban planning](#), [mobility](#), [climate change adaptation](#) or [energy flows management](#) (see also ODI, 2021, 2022).

The preparatory work for DS4SSCC delivers a **comprehensive blueprint** of a European data space for smart communities in line with European values and policies. Based on the Data Space Support Centre (DSSC), we understand Data Space (DS) as “*a distributed system defined by a governance framework that enables secure and trustworthy data transactions between participants while supporting trust and data sovereignty. A data space is implemented by one or more infrastructures and enables one or more use cases*”<sup>9</sup>. The aim is to create a single and secure market for data, to boost the digital economy and foster “*an ecosystem (of companies, civil society and individuals) creating new products and services based on more accessible data*”<sup>10</sup>.

A common European Data Space (DS) needs to provide a **secure and privacy-preserving infrastructure** as well as **clear and practical governance mechanisms**. The DS should be interoperable and follow European rules, (e.g. personal data

<sup>1</sup> <https://eurocities.eu/latest/the-100-climate-neutral-and-smart-cities-by-2030/>

<sup>2</sup> <https://eurocities.eu/stories/mapping-the-solar-transformation-in-budapest/>

<sup>3</sup> <https://eurocities.eu/stories/housing-built-with-empathy-and-respect-for-people/>

<sup>4</sup> <https://eurocities.eu/stories/carbon-free/>

<sup>5</sup> <https://eurocities.eu/latest/a-guideline-to-boost-sustainable-transport-in-cities/>

<sup>6</sup> <https://eurocities.eu/stories/beating-the-heat-in-vienna/>

<sup>7</sup> <https://www.newlocal.org.uk/wp-content/uploads/2021/10/Communities-Vs-Climate-Change1.pdf>

<sup>8</sup> [https://climate.ec.europa.eu/citizens/citizen-support-climate-action\\_en](https://climate.ec.europa.eu/citizens/citizen-support-climate-action_en)

<sup>9</sup> DSSC Glossary <https://docs.google.com/document/d/15x6WHGSoG4ZuXQw8u3AinpJrgbydriL/edit>

<sup>10</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0066>



protection, consumer protection legislation, competition law, etc.) and principles (e.g. technological sovereignty, public interest) as set in the [European Strategy for Data](#). The Staff Working Document (SWD) on common European data spaces<sup>11</sup> further specifies the required functions of a DS:

- I. *'deploy data-sharing tools and services for the pooling, processing and sharing of data by an open number of organisations, as well as federate energy-efficient and trustworthy cloud capacities and related services;*
- II. *include data governance structures, compatible with relevant EU legislation, which determine, in a transparent and fair way, the rights concerning access to and processing of the data;*
- III. *improve the availability, quality and interoperability of data – both in domain-specific settings and across sectors.'*

The European strategy for data initially put forward 9 domain-specific data spaces in strategic economic sectors and domains of public interest including industrial and manufacturing, mobility, health, energy, agriculture, public administration, financial, skills, and Green Deal. Both the Green Deal DS and DS4SSCC are **cross domain** and are foreseen to enable the EU [Green Deal Objectives](#) and UN [Sustainable Development Goals](#). In this way, DS4SSCC is envisioned to intersect with other sectoral DS, in particular the Mobility DS, Energy DS, Skills DS and Health DS.

DS4SSCC prioritises the sharing and (re)use of **data for the common good** to make cities inclusive and sustainable and empower people to address global challenges such as a green and just transition to climate neutrality by 2050. Thus, the creation of value from data sharing is understood in broader terms than monetisation. Identified areas relevant to DS4SSCC include:

- Predictive traffic management/sustainable mobility planning
- Management/efficiency of energy flows
- Zero pollution actions (e.g., air, water, soil pollution or waste)
- Data-services related to weather, climate, and extreme weather events (e.g. disaster resilience)
- Any other domain falling under the New European Bauhaus initiative (urban design, building management, public services, nature-based solutions, amongst others)

For more detail about the strategy of DS4SSCC, please refer to the project Deliverable [D1.1: Strategy Report](#).

In the context of this deliverable, it is important to highlight that DS4SSCC brings together a **large range of local, national, and European stakeholders** (Table 1) with interests that do not always converge. The emphasis is on creating **win-win situations and incentives** for stakeholders to collaborate in a trustworthy environment.

<sup>11</sup><https://digital-strategy.ec.europa.eu/en/library/staff-working-document-data-spaces#:~:text=This%20document%2C%20prepared%20in%20response,programmes%20and%20data%20infrastructure%20initiatives>



Stakeholders		Type
Public administrations & institutions	Local authorities	Cities, metropoles, regions, local government
	Other public bodies	Public city service/ utility operators (e.g., EMEL, CARRIS, STIB) National public bodies (e.g., IPMA, national transport authorities, national statistical offices, etc) National data access points (e.g. NDW)
	National governments	
	EU institutions & organisations	EU Commission, European Data Innovation Board, European Data Protection Board, etc
Private sector	Semi public or private city service operators	Utilities incl. energy, water, waste, transport infrastructures (e.g., Suez, Veolia, Enedis, Acciona, Mobico Group)
	SMEs	Technology & smart city solutions (e.g., ImpactE, Urban Software Institute GmbH, Lattitudo 40 etc.) Other local businesses
	Large corporations	Technology & smart city solutions (e.g., Google, BeMobile, TomTon, Microsoft, Cisco, IBM, Atos, IES Communications, Huawei, etc) Telecommunications (e.g., Vodafone, Orange, etc) Finances & banks (e.g., Mastercard) Global management consulting (e.g., Deloitte, McKinsey & Company, etc) Shared mobility operators (e.g., Uber, Lyft, Bolt, Lime, Cambio CarSharing, NextBike, etc.)
Academia & research institutions		Higher education institutions (e.g., University of Barcelona, Lisbon's Nova Management Information School, Université de Rennes, etc) Independent research organisations (e.g., RISE, computer vision centre, Open Data Institute, etc)
Civil society organisations & Citizens		Citizens Community organisations (e.g., citizens science organisations, neighbourhood organisations, etc) Non-governmental & non-for-profit organisations (e.g., World Data League, FING, etc.)

Table 1: DS4SSCC stakeholders

This deliverable presents the multi-stakeholder governance scheme for DS4SSCC which was developed in collaboration with cities and local authorities' representatives and broader stakeholders (i.e., private sector, academia, civil society organisations) as part of work package 2 led by Eurocities. The scheme will be further developed and validated during the deployment phase of DS4SSCC in the context of local pilots.

## 1.1. Multi-stakeholder governance scheme

The multi-stakeholder governance scheme provides a **baseline modality** for DS4SSCC data access and exchange in the deployment phase and will facilitate the development of local data ecosystems that foster trust. It is also a basis to support the future progressive harmonisation of local data ecosystems into a federated European data space for smart communities.

In the context of this work, governance is understood in a broad sense, following Micheli et al (2020:3)'s definition as '*the power relations between all the actors affected by, or having an effect on, the way data is accessed, controlled, shared and used, the various socio technical arrangements set in place to generate value from data, and how such value is redistributed between actors*'. Indeed, the work is not focusing only on technical and legal questions related to data governance but also takes into



account the variety of DS4SSCC stakeholders and the power dynamics that characterise their current relationships to create a **level playing field**.

### 1.1.1. Scope of the scheme

The multi-stakeholder scheme's objectives were to:

- Consider the roles and responsibilities of different stakeholders in the data space for smart and sustainable cities and communities
- Identify standardised access rights and business models for the management of the ecosystem
- Determine conditions for access, sharing, processing, and using data within (local) data ecosystems
- Explore mechanisms for identity management and trust
- Establish data quality assurance guidelines and standards
- Take into consideration existing European policies, legislations, and regulations.

The scheme needs to be implemented alongside the other components of the DS4SSCC blueprint which also drew on existing best practices and standards to define guidelines and mechanisms required for the upcoming deployment of the DS around four pillars (see Figure 1):

1. A Multi-Stakeholder Governance Scheme (WP2)
2. A Technical blueprint including a [Catalogue of Specifications](#) (D3.1), a Reference Architecture Model and Cookbook (D3.2) to deploy the technical infrastructure for the data space. (WP3)
3. A Roadmap and action plan (D4.2) towards a mature, connected pan-EU DS4SSCC. (WP4)
4. A Stakeholder Forum (WP1 & WP5), including capacity building activities. The deliverables of the preparatory action are built on the regular interaction with the stakeholder forum which brings together individuals from both the supply and demand side.

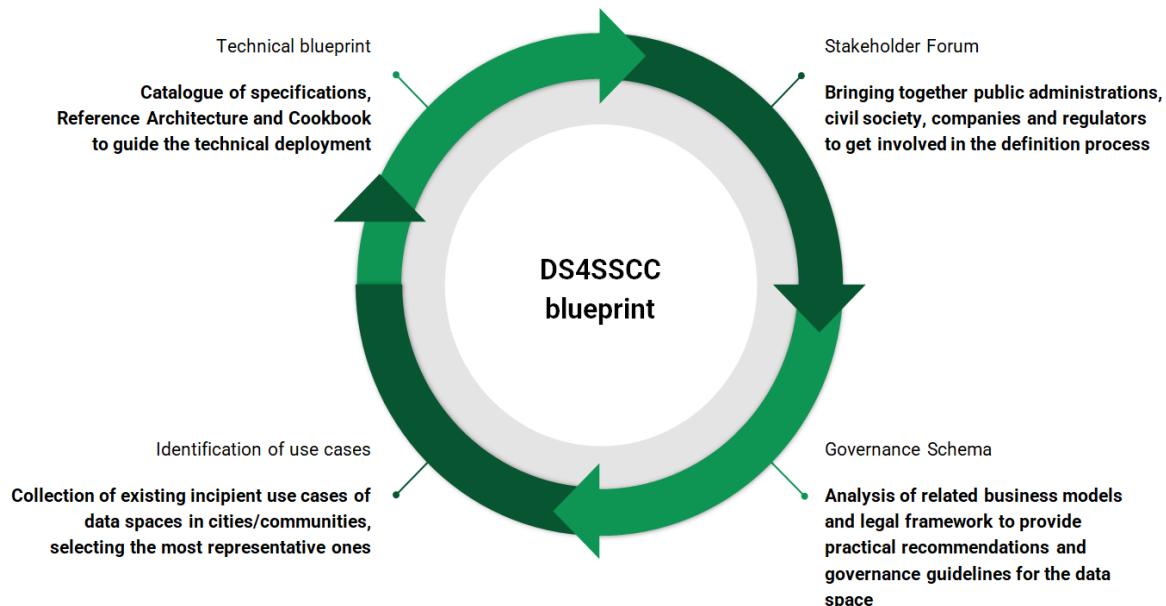


Figure 1: DS4SSCC Blueprint

The multi-stakeholder governance scheme was co-developed during the activities of **WP2 led by Eurocities**. It was presented and validated during the **DS4SSCC Stakeholder Forums** which convened monthly and had a representation of broader stakeholders covering the 'quadruple helix' (public sector, private sector, academia and civil society).

The work was developed by the **Governance Group** which brought together representatives of local authorities during a series of workshops. The Governance Group workshops were designed to capture existing knowledge and experience on local data sharing with different configurations of stakeholders (e.g., municipalities, metropolitan areas, regions, private sector, academia, civil society, etc.). See Appendix 4 for more information about the Governance Group.

The work and exchanges conducted during the workshops informed the first iteration of guidance and principles for the governance of the data space for smart communities. The workshops drew on **concrete use-cases** to discuss data sharing in different local data ecosystems and identify lessons learnt and best practices. For each use-case we mapped:

- The stakeholders involved using the quadruple helix
- The datasets shared and used as well as the data flows between organisations
- The other types of exchanges between stakeholders which facilitate data flows (e.g., knowledge exchange, legal support, supply of data skills, provide data services, citizens involvement)
- The mechanisms underlying data exchanges (i.e., Cooperation/ decision making mechanisms, Value creation, Value Distribution, Financing, Contractual agreements)



The development of the scheme was further enriched by frequent inputs from the broader community via expert interviews, surveys, and exchanges with the DSSC. For more information about the work conducted by WP2 throughout the preparatory action, please refer to our [work plan](#) (see also Appendix 4 for a detailed overview of the methodology).

### 1.1.2. Selection of use-cases

Given their areas of competencies and practical knowledge, local authorities play a central role in exploring new modalities and frameworks to responsibly govern data in ways that safeguard it from harm while delivering public value. It has been recognised that ‘city governments stand out as key stakeholders, who might act as promoters of innovative approaches for data sharing and use for the public interest (Liva et al 2023, p.12).

WP2, thus, identified use-cases which reflected **different configurations of stakeholder collaborations** and provided **different approaches on the role of local authorities in data ecosystems**.

The criteria for the selection of use-cases were:

- Be grounded in cities and communities and cutting across domains
- Involve different types of stakeholders (e.g. private sector, governments & public administrations, research & academia, civil society)
- Align with [Green Deal Objectives](#), the [EU Mission on Climate Neutral and Smart Cities](#) and/or the [New European Bauhaus](#) initiative.
- Align with the [Living-in.EU principles and values](#)

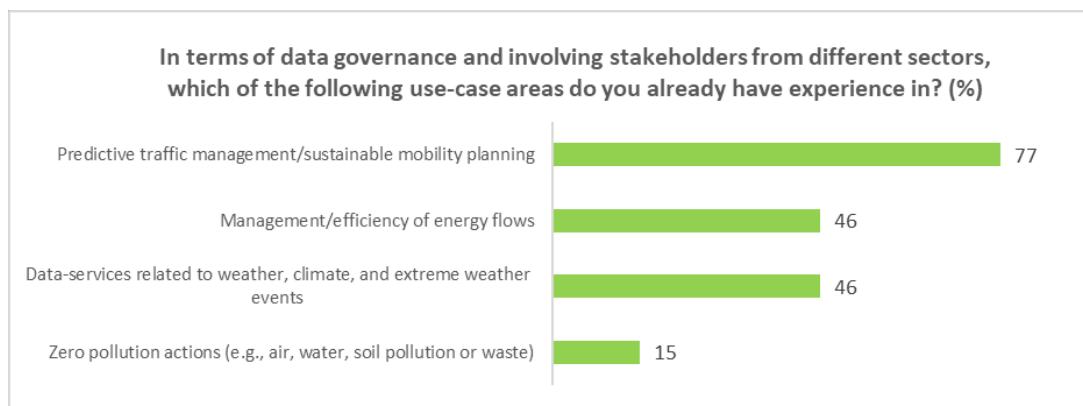


Figure 2: Existing experience in Governance Group

After a scoping exercise of relevant areas and associated experiences of data sharing in the Governance Group (see Figure 2 & Table 2), we identified four relevant initial use-cases.



Selection criteria	Name & Coordinator of local initiative			
	IDEA City of Amsterdam	LxDataLab Lisbon City Council	DataCity Lab Barcelona City Council	Rubi Brilla Rubí City Council
<b>Aligned with Green Deal Objectives</b>				
Accelerating the shift to smart & sustainable mobility	✓	✓		
Zero-pollution ambition for a toxic-free environment	✓	✓		
Supplying clean, affordable, and secure energy			✓	✓
Leave no-one behind (Just Transition)			✓	✓
<b>Multi-stakeholder initiatives</b>				
Public sector	✓	✓	✓	✓
Private sector	✓		✓	✓
Academia & research institutions		✓	✓	
Civil society		✓		✓

Table 2: Selection criteria for WP2 use-cases

Participants also had the opportunity to enrich the work and the exchanges by bringing up other relevant multi stakeholder use cases which demonstrated other aspects of collaborations and data sharing. These included four more use-cases: the Rennes Urban Data Interface (RUDI), the Climate Data Hub in Région Centre-Val de Loire, the Amsterdam Smart Port Platform and MyData Operator in Helsinki (see Table 3 & Appendix 4 for a detailed overview of the methodology).

### 1.1.3. Overview of use-cases

Name & Coordinator	Overview	Characteristics	Cooperation model	Maturity
WP2 Use-Cases				
<b>IDEA</b> City of Amsterdam	The Intelligent Data Exchange Alliance (IDEA) brings local, regional, and national public bodies in the Netherlands together to create high-quality traffic data and cooperate more closely with the private sector. This initiative is led by Amsterdam City Council and, to begin with, focused on improving data on road works. By providing high-quality, real-time data on road works, Navigation Service providers are able to provide better information to road users and road authorities have insight into their roadworks' actual impact. More broadly, it enables better traffic management and air pollution reduction.	Collaboration between public bodies at different levels (city, regional and national) and private sector Use of third-party intermediary (National Data Access Point) and use of data services providers (data quality partner)	Trusted third party (intermediary)	Operational
<b>LxDataLab</b> Lisbon City Council	Lisbon city council provides, acquires, and uses mobility-related data to develop real time applications and foster better policy and decision making. The Lx Data Lab brings the municipality, universities, and higher education institutions together in a cooperation protocol. The Lx Data Lab aims to reuse and generate data collected and/or acquired by the municipality through analytical and forecast challenges including in the domain of mobility.	Collaboration with academia (public and private institutions) as well as with civil society organisations (World Data League)	Pragmatic data sharing As a Service model (Data as a service, Software as a Service) Open Data	Operational
<b>DataCity Lab</b> Barcelona City Council	The project aimed to assess the impacts of Energy Communities in three Social Superblocks of the city within three neighbourhoods of Barcelona: Poblenou, La Marina and Vila de Gràcia. The challenge consisted in using data to identify the potential of photovoltaic panels on public spaces in these three neighbourhoods. The tool developed allows the municipality to assess the maximum surplus of solar energy - generated from municipal buildings and public spaces – in relation to the maximum impact on the spending of households in a situation of energy poverty.	Collaboration with private sector (SMEs and large private entity) and academia	As a Service model (Data as a service, Software as a Service) Open Data Data Donation (private sector)	Implementation
<b>Rubi Brilla</b> Rubí City Council	Rubi Brilla aims to reduce city energy consumption, accelerate the transition to renewable energy and empower citizens and companies to make meaningful changes. The city collaborated with a SME to develop a geoportal tool which allows better decision making and informs local policy on energy and planning. The city developed a consent mechanism to obtain individual smart meter data which enables them to provide personalised energy advice to individuals.	Direct involvement of citizens Collaboration with other local authorities	As a Service model (Data as a service, Software as a Service) Open Data Data Donation (private sector) Personal Data Intermediary (citizen data)	Operational



Other relevant local multi-stakeholder use-cases				
<b>Rennes Urban Data Interface</b> Rennes Métropole	RUDI is a local data sharing platform enabling stakeholders (e.g., service operators, researchers, public and private bodies) to share their data while retaining control over it. RUDI effectively provides a one-stop shop enabling the safe and ethical sharing of a wide range of regional data that can be used to develop and improve services.	Multi-stakeholder initiative led by metropole	Trusted third party (intermediary)	Operational
<b>Climate Data Hub</b> Région Centre-Val de Loire	The Climate Data Hub aims to foster the sharing and reuse of climate-related data between public and private stakeholders and thus support climate change adaptation. One of the first use-case focuses on urban heat islands to 1) identify locations of heat islands in cities and the severity of their impact to prioritise projects, 2) assess the impact of forthcoming urban developments on urban heat concentration.	Multi-stakeholder initiative led by region	Trusted third party (intermediary)	Preparatory
<b>Smart Port Platform Amsterdam</b> City of Amsterdam	The objective of the platform is to establish an infrastructure for smart data exchange, where all parties agree in advance on which data can be shared under specific circumstances. This ensures that when the situation demands it, such as during an incident in the port, relevant data can be quickly exchanged among all involved parties.	Collaboration between public and private sectors, and data sharing between private companies which are competitors under set conditions	Pragmatic data sharing Trusted third party (intermediary)	Preparatory
<b>MyData Operator</b> City of Helsinki	The city of Helsinki has deployed a <a href="#">MyData operator</a> system using consent management mechanisms which enables individuals to consent to share data in the context of a specific service and for a stated purpose.	Control and decision of personal data use by citizens	Personal data intermediary	Implementation

Table 3: Overview of WP2 use-cases

## 1.2 Contextual background

Given the interrelated and complex challenges related to climate change, the **role of cross-sectoral data sharing and use in tackling the climate crisis** has increasingly been recognised (ODI, 2021, 2022, Susha et al 2023, Verhulst 2021). Municipalities and local governments generate large amounts of data across various domains, ranging from transport, waste management and urban planning to social services and health. Thus, secure, and trustworthy access to and strategic use of public sector data is critical to address long-standing inequalities, ensure better provision and access to public services, and support the transition to climate neutrality by 2050 (OECD, 2021, van Ooijen et al 2019, WEF 2022). Private sector data, such as from private utilities (energy, water), telecommunications companies or MaaS providers, would also offer communities and local governments valuable insights in their efforts to address both short term and long-term societal challenges and deliver better services (Micheli, 2022, Verhulst, 2021). More broadly, research has shown the crucial role of (near real-time) data to inform the design, evaluation and forecasting of policy and more broadly support climate adaptation (Bibri, 2021, Maffei et al 2020, Mauree et al 2019).

Cities and local authorities can play a **crucial role in local data ecosystems** as creator, user and provider of public, proprietary and/or personal data, and the digital infrastructures in which data is integrated (Chignard & Glatron 2023, Granel et al 2022). They are also key stakeholders who can facilitate and be the gatekeepers of innovative approaches for data sharing and use for the public interest (Liva et al 2023, p.12). Furthermore, research shows that when **citizens and communities are involved in the stewardship and (re)use of data**, it can bolster societal and economic equity, foster greater accountability, and contribute towards increased public confidence in the use of data (Ada, 2021:10).

In this context, the creation and deployment of horizontal European data spaces - DS4SSCC and the Green Deal Data Space - are key in fostering cross-sector and **multi stakeholder data collaborations** understood as a ‘form of cross-sector partnership to exchange and integrate data and use it to generate public value’ (Klievink et al, 2018:379).

### 1.2.1. Local data ecosystems and sharing

Local authorities have long collected and used multiple data including statistical data, on social services, urban infrastructures, and more, to generate insights on policy priorities and inform decision-making. In the past two decades, this trend has accelerated through the deployment of smart city initiatives across Europe (Correia et al, 2022) and the steady increase of public sector open data portals and urban platforms (Barn, 2018; Pereira, 2017). Local authorities collect, store, use, visualise and share data in a **complex city data ecosystem integrated in a technological and institutional environment** (Gupta et al, 2020; Liva et al, 2023, Meijer, 2018, see Figure 3). Data generated by the private sector (including via PPP or in public spaces) and by citizens (i.e., passively through applications and platforms or actively through crowdsourcing and citizen science), further adds to these fragmented local data ecosystems.

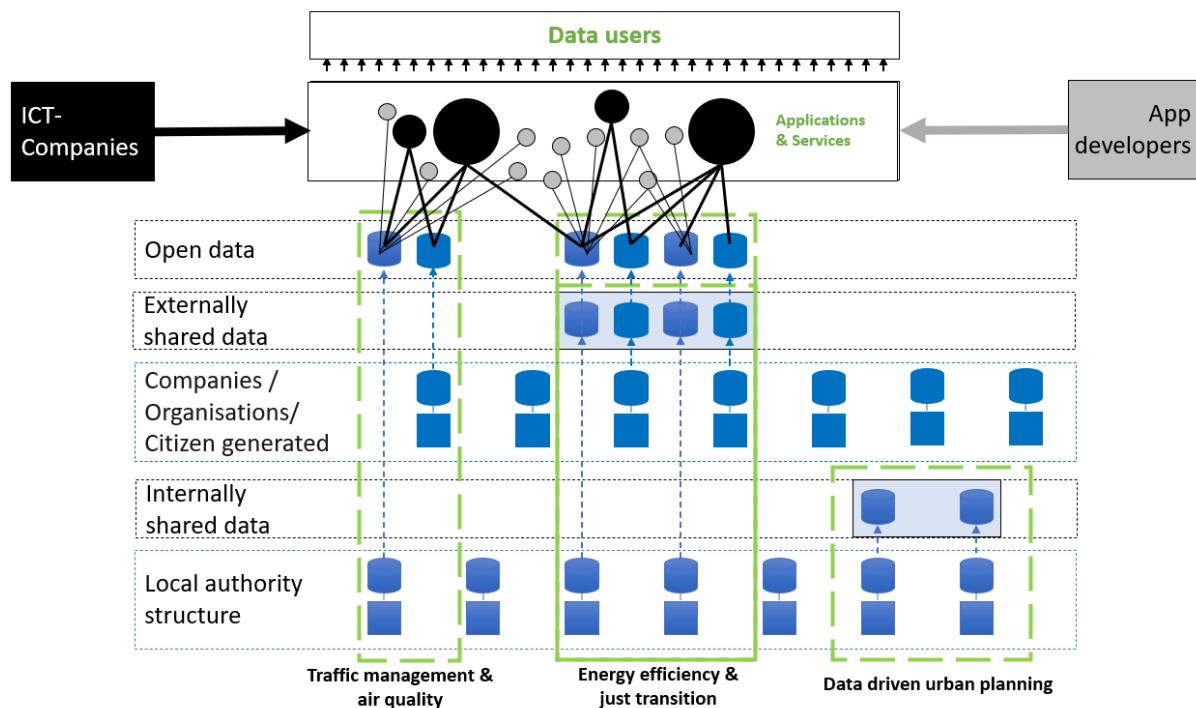


Figure 3: City data ecosystems

In their report *Innovation and Data Use in Cities*, the OECD (2021) found that 80% of European cities surveyed had **existing collaborations with academia, think tanks and research institutions** to collect and analyse data, evidencing a thriving collaborative space between non-for-profit organisations (including academia) and the public sector. Local partnerships can foster data sharing through multi-stakeholder approaches including Urban Observatories (Acuto et al 2021) or Living Labs (Ruijter & Meijer, 2020). Data sharing also takes place via **local and global citizen and community initiatives** ranging from the crowdsourcing of data on air quality<sup>12</sup>, biodiversity and water quality to the use of ArcGIS software to collect and aggregate data on the built environment (e.g., ODI, 2022; Willians, 2020). It is important to note, however, that citizen and civil society participation in the data practices of local administrations remain limited (Cardullo & Kitchin, 2019; Przybilowicz et al 2022)

The OECD report shows that **existing collaborations and partnerships with the private sector are also limited** with only 60% of cities reporting it (ibid:122). Recent work, conducted on B2G data sharing has identified the **four more recurring models** used by local authorities to access private sector/proprietary data. These include data donorship, public procurement of data, data partnerships and pools, and data sharing obligations (Micheli, 2022):

- Public procurement of data is when local authorities pay companies to obtain data
- Data donorship [also called ‘data altruism’ or ‘data philanthropy’] is when companies voluntarily give data to public bodies or other organisations

<sup>12</sup> <https://eurocities.eu/latest/how-data-visualisation-contribute-to-cleaner-air-in-our-cities/>



- Data partnerships identify win-win situations and shared interests to encourage public and private stakeholders to share data
- Data sharing obligation clauses can be used as a legal means when inserted in tender contracts to obtain data.

While **public procurement of data** is widely used by municipalities, it is often described as restrictive due to transaction costs and lack of data standards and interoperability (Micheli, 2022, Liva et al 2023). Data partnerships based on mutual interests are less common, however, they have a higher likelihood of being successful while not straining the budget of local governments (Liva et al 2023:12) (see below on opportunities).

**Data donorship** by corporations such as telecommunication companies (e.g. Vodafone), banks (e.g. Mastercard), navigation service providers (e.g. Waze) or digital platforms (e.g. Google Community Mobility reports, Meta's Data for Good) have also increased in the past years with various successful examples (e.g. Benjamin et al, 2022, Verhulst et al 2019) Data donations, often framed within the narrative of social good, are not without criticism. They can be a mean for companies to build new data-driven services to be sold to other cities in the future, ultimately reproducing the asymmetrical power relations between large corporations and other actors and legitimating extractive, profit-oriented data practices by companies (Espinoza & Aronczyn, 2021, Micheli, 2022). Furthermore, recent research shows that resistance from businesses to share data is more important for public interest purposes, such as statistics, inclusion, and education than in the case of emergencies (Susha et al 2022, p.12).

In recent years, there has also been a growing interest in **data intermediaries** and the role that they could play in creating a fairer data economy (Micheli et al 2020; 2023). Data intermediaries are understood as '*mediators between those who wish to make their data available, and those who seek to leverage that data. The intermediary works to govern the data in specific ways and provides some degree of confidence regarding how the data will be used.*' (Janssen & Singh, 2022: 1). Another definition provided by the OECD states that '*data intermediaries enable data holders to share their data, so it can be re-used by potential data users. They may also provide additional added-value services such as data processing services, payment and clearing services and legal services, including the provision of standard-liscence schemes*' (2019, np). Intermediaries cover a **range of organisational forms of data exchanges** including data cooperatives, data commons, data unions, personal information management systems (e.g., MyData) and trusted third parties and tend to focus on creating societal value and supporting individuals in managing their data (CDEI, 2021, Micheli et al, 2020, 2023). Local authorities are innovating in the field of data intermediaries, with for example Digital Flanders experimenting with Solid<sup>13</sup>, a decentralised way of storing data in personal pods<sup>14</sup> or Helsinki deploying a MyData

<sup>13</sup> <https://solidproject.org/>

<sup>14</sup> <https://www.healthskouts.com/2022/04/12/citizen-centric-data-platform-will-put-flanders-on-the-map-as-digital-health-frontrunner/>



operator<sup>15</sup> system using consent management mechanisms which enable individuals to share data in the context of a specific service and for a stated purpose.

The results of the survey we conducted in January 2023 (see Appendix 4) confirmed the existing research on local data sharing practices highlighted above. All public sector organisations surveyed had open data initiatives in place and the majority of them acquired data via bilateral data sharing agreement, public procurement or Service Level Agreements (SLA). Government and public administrations also reported cross-sector data collaborations with other public sector organisations (92%), industry & SMEs (67%), research institutes and academia (84%) and civil society (49%). Interestingly, approximately half (18 out of 39) of public sector organisations defined themselves either as data intermediary or urban platform provider, demonstrating the lead taken by the public sector in terms of local data sharing.

### 1.2.2. Challenges & opportunities

The challenges of data sharing for public sector organisations have been well documented. These include uneven **data quality, lack of interoperability and common standards, the siloing of data between services, a shortage of skills, concerns about GDPR and legal compliance, perceived security, ethics and reputational risks, budgetary constraints and fragmented IT infrastructure and capabilities** (CDEI, 2021, OECD, 2021; van Ooijen et al 2019). In addition, these barriers can be further entrenched by a **lack of strategic leadership** on digital transformation and long-term investment regarding data quality and digital infrastructure (Pittaway & Montazemi, 2020, Tangi et al 2021). Importantly, there is a high degree of variation whereby capabilities, investment, and negotiation power depend on the size, data maturity and/or strategic agenda of local authorities.

Private sector organisations also face barriers for sharing data, such as **the costs of preparing data, a perceived lack of incentives and risks regarding competition and commercial confidentiality, privacy, and security** (Helderop et al., 2019; Mercille, 2021; Micheli, 2022). Private companies might not be aware of the needs of local government or familiar with all relevant legal frameworks. Lastly the working methods (in terms of agility), the interests and positions of private sector companies, often centred on economic and market-drive incentives can create important cultural and organisational barriers (Klievink et al. 2018, Susha et al 2023). For example, some tensions in local data sharing, and B2G in particular, can revolve around how stakeholders understand and prioritise **value creation from data**. Is data understood mostly as a commodified asset and source of revenues (e.g., the models of the data marketplace and data brokers fit this understanding) or is it seen as a public good?

However, it is important to note that **shared interests** between the public and private sector can be identified<sup>16</sup>. The granular data produced by local authorities can represent rich sources of information for private companies to improve their products and services and innovate by enriching their datasets and creating additional value.

<sup>15</sup> <https://oldwww.mydata.org/mydata-operators/>

<sup>16</sup> See B2G data sharing workshop series: <https://digital-strategy.ec.europa.eu/en/events/b2g-data-sharing-cities-series-5-workshops>



For example, electricity network operators would benefit from accessing data on urban development projects, forecasting data on housing and population growth, energy performance of housing, development of transportation networks and, mobility policies which are often produced by local authorities (Chignard and Glatron, 2023). In turn, energy data produced by network operators is a crucial resource for local authorities to inform their policies on energy transition or mobility. Furthermore, making data available can present business and societal opportunities such as the development of new products and the delivery of better services (OECD, 2019 WEF 2021). Finally, data collaborations allow organisations to draw on external skills and resources that they do not have in house, resulting in knowledge spill-over (OECD, 2019). Identifying mutual interests to create **win-win situations and have a strategic alignment between partners** are key in ensuring the success of data sharing across sectors (Chignard & Glatron, 2023, Liva et al, 2023; Susha et al,2022).

## 2. DS4SSCC Code of Conduct

The DS4SSCC Code of Conduct below provides the foundational **principles, roles, responsibilities, governance structures and legal frameworks** for participants of the data space. The Code of Conduct will be tested and further developed during the three-years of deployment of the data space for smart communities<sup>17</sup>.

### 2.1. Vision & Principles

The vision and principles are at the foundation of DS4SSCC and will inform the governance processes of the DS and of the different use-cases that will be part of it. Indeed, governance processes build '*on the basis established through core principles to enshrine systematic mechanisms for making and implementing decisions. These processes include defining and communicating the roles and responsibilities of different actors and stakeholders; establishing oversight, transparency, and accountability policies and mechanisms; clarifying decision flows across stakeholders; and creating procedures for dispute resolution*' (Fritzenkötter et al 2022, p.8). It is thus crucial to co-define with a broad range of stakeholders a **shared vision** and **common principles** and ensure a strong buy-in.

To develop the DS4SSCC vision, we conducted a range of activities with stakeholders and experts including workshops, interviews, and surveys. The work was presented, refined and validated on an ongoing basis to stakeholders as part of the Stakeholder Forum workshops (see Appendix 4 for an overview of the methodology).

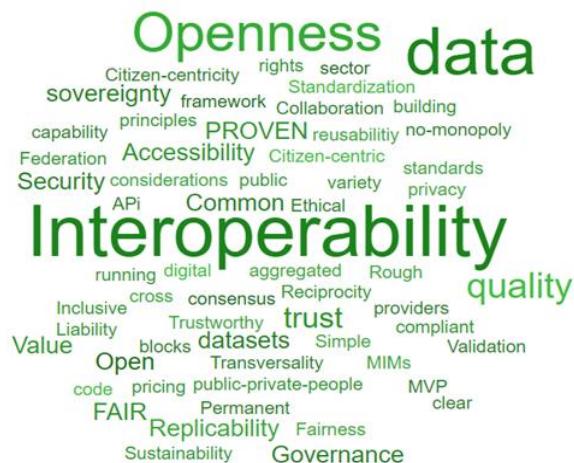


Figure 4: DS4SSCC Principles  
(Stakeholder Forum March 2023)

We asked stakeholders to provide feedback on the principles during the stakeholder forum workshops on the 3rd of May and 6th of September. We distinguished between principles related to organisational processes and to data governance.

The DS4SSCC **organisational principles** include:

- The sharing and re(use) of data via DS4SSCC should create **tangible societal value and public benefits** on top of economic value.

<sup>17</sup><https://digital-strategy.ec.europa.eu/en/events/info-day-deployment-data-space-smart-communities>



Local authorities, communities, and citizens should be the main beneficiaries of data sharing and reuse in the context of DS4SSCC.

- The purpose of data sharing and reuse should align with the **European Green Deal objectives** and with the **European data strategy**, including on data and technological sovereignty. (PUBLIC GOOD, SOVEREIGNTY)
- The data space should **level the playing field** in terms of data sharing and reuse between different types of stakeholders. (FAIRNESS/ INCLUSIVITY/ SOVEREIGNTY)
- The **added value should be retained in the data ecosystem** and surplus either reinvested or returned to the ecosystem in other forms. (RECIPROCITY/ FAIRNESS)
- The **purpose of data sharing and reuse should be clearly explained** for each use-case and demonstrate this societal value/public benefit.
- The governance and infrastructure of DS4SSCC should abide by the **principles of technological and data sovereignty**<sup>18</sup> with particular attention to vendor lock-ins (SOVEREIGNTY, SECURITY)
- Data space participants should **be represented in Governance Bodies** and be able to contribute to the decision-making processes. This includes participation of the main beneficiaries: local governments, communities and citizens (REPRESENTATIVITY/ PARTICIPATION)

In terms of **Data Governance**, stakeholders agreed on principles which align with the European Strategy for Data and the [FAIR principles](#) (Wilkinson et al. 2016:4, see Figure 5).

Organisational Processes & Decision Making	Data Governance
Citizen-centricity / public interest	Protection of human & digital rights
Transparency & Trust	Ethical & responsible use of data
Representativity	Data & Technology Sovereignty
Consensus process & Reciprocity	FAIR <sup>19</sup>
Participation	Data quality
Inclusion of broad range of stakeholders	Security & Data Protection
Oversight & Monitoring	Privacy by design
Accountability	Decentralised solutions
Enforcement of governance rules	Data minimisation
Fairness	Common standards
Assessment of carbon footprint of digital infrastructure	Work with linked data (e.g. OSLO <sup>20</sup> , LDES <sup>21</sup> )
	Open-Source software <sup>22</sup>

Table 4: Principles for DS4SSCC

<sup>18</sup> [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS\\_BRI\(2020\)651992\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS_BRI(2020)651992_EN.pdf)

<sup>19</sup> See FAIR principles: <https://www.go-fair.org/fair-principles/>

<sup>20</sup> <https://joinup.ec.europa.eu/collection/oslo-open-standards-linked-organisations-0/about>

<sup>21</sup> <https://joinup.ec.europa.eu/collection/semic-support-centre/linked-data-event-streams-ides>

<sup>22</sup> <https://joinup.ec.europa.eu/collection/free-and-open-source-software>



### Box 2 | The FAIR Guiding Principles

#### To be Findable:

- F1. (meta)data are assigned a globally unique and persistent identifier
- F2. data are described with rich metadata (defined by R1 below)
- F3. metadata clearly and explicitly include the identifier of the data it describes
- F4. (meta)data are registered or indexed in a searchable resource

#### To be Accessible:

- A1. (meta)data are retrievable by their identifier using a standardized communications protocol
- A1.1 the protocol is open, free, and universally implementable
- A1.2 the protocol allows for an authentication and authorization procedure, where necessary
- A2. metadata are accessible, even when the data are no longer available

#### To be Interoperable:

- I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- I2. (meta)data use vocabularies that follow FAIR principles
- I3. (meta)data include qualified references to other (meta)data

#### To be Reusable:

- R1. meta(data) are richly described with a plurality of accurate and relevant attributes
- R1.1. (meta)data are released with a clear and accessible data usage license
- R1.2. (meta)data are associated with detailed provenance
- R1.3. (meta)data meet domain-relevant community standards

Figure 5: FAIR Principles

## 2.2. Roles

Based on the DSSC glossary (version for public consultation<sup>23</sup>), we define:

- **Data Subject:** an identified or identifiable natural person (GDPR, article 4<sup>24</sup>)
- **Data space participant:** a party that has committed to the governance framework of a particular data space and may have one or more roles in it.
- **Data space role:** a distinct and logically consistent set of responsibilities within a data space, that encompass associated rights and duties required to perform specific tasks, and that are designed to be fulfilled by one or more participants.

We define three categories of roles (see Table 5) in the context of DS4SSCC:

- **Participatory:** roles involving data transactions;
- **Intermediary:** roles facilitating data exchanges and/or enabling the functioning of the DS;
- **Governing:** roles related to the development, implementation, enforcement and facilitation of rules of engagement and the governance framework of the DS.

DS participants can have more than one role in accordance with the relevant legal frameworks (see section 2.5) and the agreed governance rules (see section 2.4)

<sup>23</sup> [https://confluence.external-share.com/content/80889/dssc\\_blueprintv05\\_public\\_consultation/142606408](https://confluence.external-share.com/content/80889/dssc_blueprintv05_public_consultation/142606408)

<sup>24</sup> <https://gdpr-info.eu/art-4-gdpr/>



Roles	Description
Participatory	<b>Data holder:</b> 'A legal person, including public sector bodies and international organisations, or a natural person who is not a data subject with respect to the specific data in question, which, in accordance with applicable Union or national law, has the right to grant access to or to share certain personal data or non-personal data' (DGA, article 2)
	<b>Data provider:</b> A DS participant that, in the context of a specific data transaction, technically provides data to the data users that have a right or duty (granted by the data rights holder) to access and/or receive that data. (DSSC Glossary)
	<b>Data user:</b> A natural or legal person who has lawful access to certain personal or non-personal data and has the right, including under Regulation (EU) 2016/679 in the case of personal data, to use that data for commercial or non-commercial purposes (DGA, article 2)
	<b>Use-case participants:</b> A DS participant that is involved in one or several use-cases. While the use-case participants can take part in data transactions, it is not always the case.
Intermediary	<b>Data intermediaries/ enabling services:</b> A DS participant that provides a (technical or non-technical) service enabling or facilitating trustworthy data transactions for data space participants. Examples of data space services include identity management, vocabulary providers, authorisation management, consent management, clearing house. <b>Data intermediaries can be registered and DGA-compliant as per Article 10 of the Data Governance Act.</b> In this case they have to be <b>neutral third parties</b> and have a structural separation between the intermediation services they provide and other data services (see section 2.5.1).
	<b>Personal data intermediaries:</b> A DS participant which facilitates the management of personal data, often providing direct mechanisms for citizens to give permission to use their data to organisations.
Governing	<b>Governance bodies (e.g., Governance Authority, Advisory boards):</b> The party(ies) that is (/are) accountable for the governance of a particular governance framework. In any scenario, they <b>do not replace the role of public enforcement authorities.</b> (DSSC Glossary)
	<b>Orchestrator/ coordinating entity:</b> Organisation which coordinates/ orchestrates the data space ecosystem and ensures its functioning and that participants abide by the agreed common rules and principles.
	<b>Community support bodies (e.g. Training &amp; capacity building, legal &amp; technological support)</b> animates/supports the DS4SSCC community of practice.

Table 5: DS4SSCC Roles



## 2.3. Responsibilities

To be able to join and participate in DS4SSCC, all participants **must**:

- Commit to DS4SSCC vision & core principles
- Sign and comply with DS4SSCC constitutive agreements or membership agreements
- Monitor compliance with relevant regulatory frameworks
- Commit to adequate security and data protection mechanisms as per data governance principles
- Comply with the data space's technical & data standards (see architecture model/ Catalogue of Specifications)
- Have a DS4SSCC reference person in place (e.g., Data Protection Officer, Data Chief Officer, Project Manager)
- Be transparent, and provide data and reporting for audits

In addition, they should when feasible and applicable:

- Conduct data maturity assessments<sup>25</sup>
- Complete a data ethics assessment for data (re)use and associated use-cases
- Share methods used to get insights from data
- Share use-cases in common repository

The DS governance authority (see Figure 7) will be in charge of monitoring practices and enforcing compliance. Participants who are found in breach of their responsibilities should receive first a warning with a timeline to address their shortcomings. If repeatedly found in breach, the matter should be discussed by the DS4SSCC participants representative committee and the relevant advisory boards while the Governance Authority should take the final decision.

Table 6 provides an initial sketch of the specific responsibilities associated with each of DS4SSCC role (non-exhaustive) as well as recommended provisions and mechanisms to foster accountability and support participants to meet these responsibilities. These will be further elaborated on, drawing on the pilots during the deployment of DS4SSCC. Finally, Figure 6 maps the DS4SSCC ecosystem of stakeholders in relation to DS4SSCC roles.

---

<sup>25</sup> See Bahim et al 2020

Roles	Specific Responsibilities	Recommended provisions
		Participatory roles
<b>Data holder</b>	Give and retract consent Are informed and agreed about the purposes for which and the means by which data is processed	Multiple levels mechanisms of giving consents (e.g. Personal Data Management Systems)
<b>Data provider</b>	Define reference datasets Define Dataset terms and conditions of use (including clear data licences (open, restricted, private, etc.) Anonymisation of data Maintain/ check availability of datasets Ensure data quality Inform when data is no longer available/ up to date Provide sampling of data for better understanding of value of data and possibility of reuse Make methods of processing data open & transparent Make available and keep updated metadata & relevant documentation for data reuse Publish clear and transparent data catalogue and quality standards	Data quality insurance mechanisms with clear control/ KPIs Mechanisms for responding to questions or feedback about data provided When possible, embed process to know data usage (API Key) for monitoring purposes Rewards but also penalties when failure to deliver what has been agreed Transparency and feedback mechanisms to data holders
<b>Data user</b>	Be transparent about data usage Be aware of the quality/limitations of data used Share insights/ documentation on the added value of the used data Provide feedback for all (data providers, right holders)	Tools for extracting and analysing data Training to understand how to use data Channels for providing feedback or requesting specific data to data providers Safe experimenting environments (e.g., sandbox)
<b>Use case participants</b>	Share insights/ documentation on the added value of use-cases Demonstration public value of use-case	Repository of DS4SSCC use-cases
<b>Intermediary roles</b>		
<b>Data intermediaries/ enabling services</b>	Maintain technical infrastructure/ services they provide Provide technical assistance/ support to data space participants Enable connections with other data spaces Disclose content plugging/processes Monitor services and inform users if deterioration/discontinuity Publishing clear documentation on data product possibilities	Should have relevant expertise and technical capabilities Recognised by EU in case of DGA compliant intermediaries (certification processes)



Governance Roles		
<b>Governance bodies</b>	<p>Monitor compliance to DS4SSCC processes (constitutional/ contractual processes)</p> <p>Request providers to correct/add relevant metadata</p> <p>Ensure &amp; monitor responsible and fair use of data</p> <p>Make decisions in a transparent manner</p> <p>Advise on technology and data standards for data space &amp;</p> <p>Ensure convergence of solutions</p> <p>Define strategic direction of DS</p> <p>Resolve conflicts</p> <p>Manage change and continuity of data space (e.g., decide new rules/ edit rules)</p> <p>Checks and certifies data agreements according to DS4SSCC principles</p>	<p>The governance bodies should be representative of the data space's stakeholders &amp; participatory/ enabling roles</p> <p>Decision making mechanisms</p> <p>Mechanisms to remove datasets if needed</p> <p>When possible, automation of governance processes</p> <p>Legal and technical expertise</p>
<b>Orchestrator/ coordinating entity</b>	<p>Take care of onboarding new participants</p> <p>Inform all actors about the guidelines/rules/negotiations</p> <p>Find new stakeholders &amp; connect participants working on similar use-cases</p> <p>Maintain a common catalogue</p> <p>Manage communication channels</p> <p>Organise working group meetings, events, etc to increase awareness in the ecosystem and interactions frequency.</p> <p>Manage change and continuity of data space</p>	<p>Mechanism to check if participants, in particular data providers, are still active</p> <p>Provide a regular overview of developed data products with used data</p> <p>When possible, embedding process to know data usage (API Key) for monitoring purposes</p> <p>Mechanism to ensure that knowledge and best practices flow and that technical solutions converge, part of onboarding is to identify relevant existing use-cases, solutions and partners</p> <p>Match-making system</p> <p>Feedback loops</p>
<b>Community support bodies</b>	<p>Provide support to users to onboard and comply with DS technical and governance standards</p> <p>Provide training &amp; capacity building</p> <p>Organise Knowledge exchange activities</p> <p>Help stakeholders work together on projects or initiatives</p> <p>Provide technical and governance support</p> <p>Support negotiation collaborations/ contracts</p>	<p>Repository of best practices/ examples use-cases/ guides</p> <p>Data steward forum for common coordination and alignment</p> <p>Technical support to set-up exchange mechanisms according to agreements</p>

Table 6: DS4SSCC roles and associated responsibilities

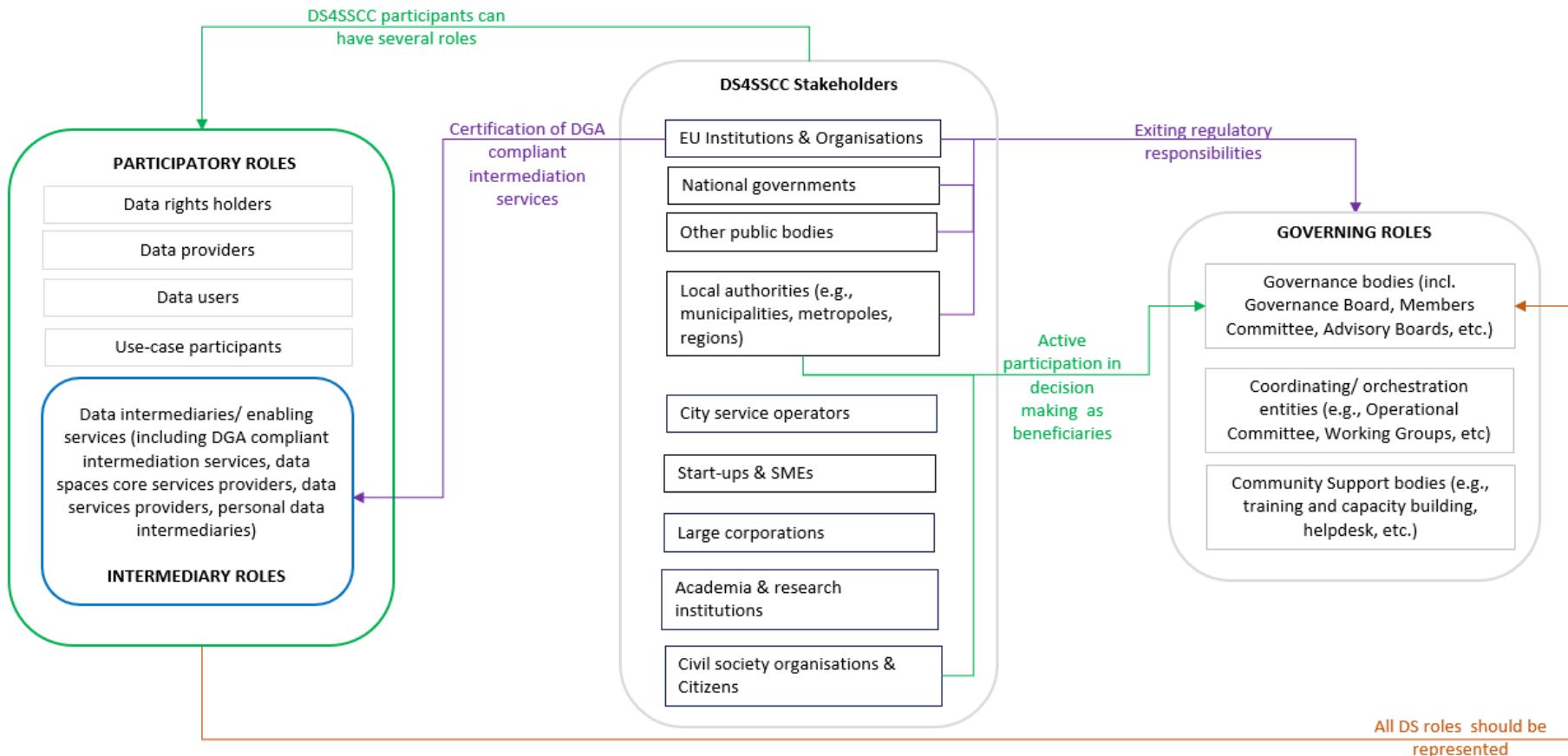


Figure 6: DS4SSCC Stakeholders and associated roles

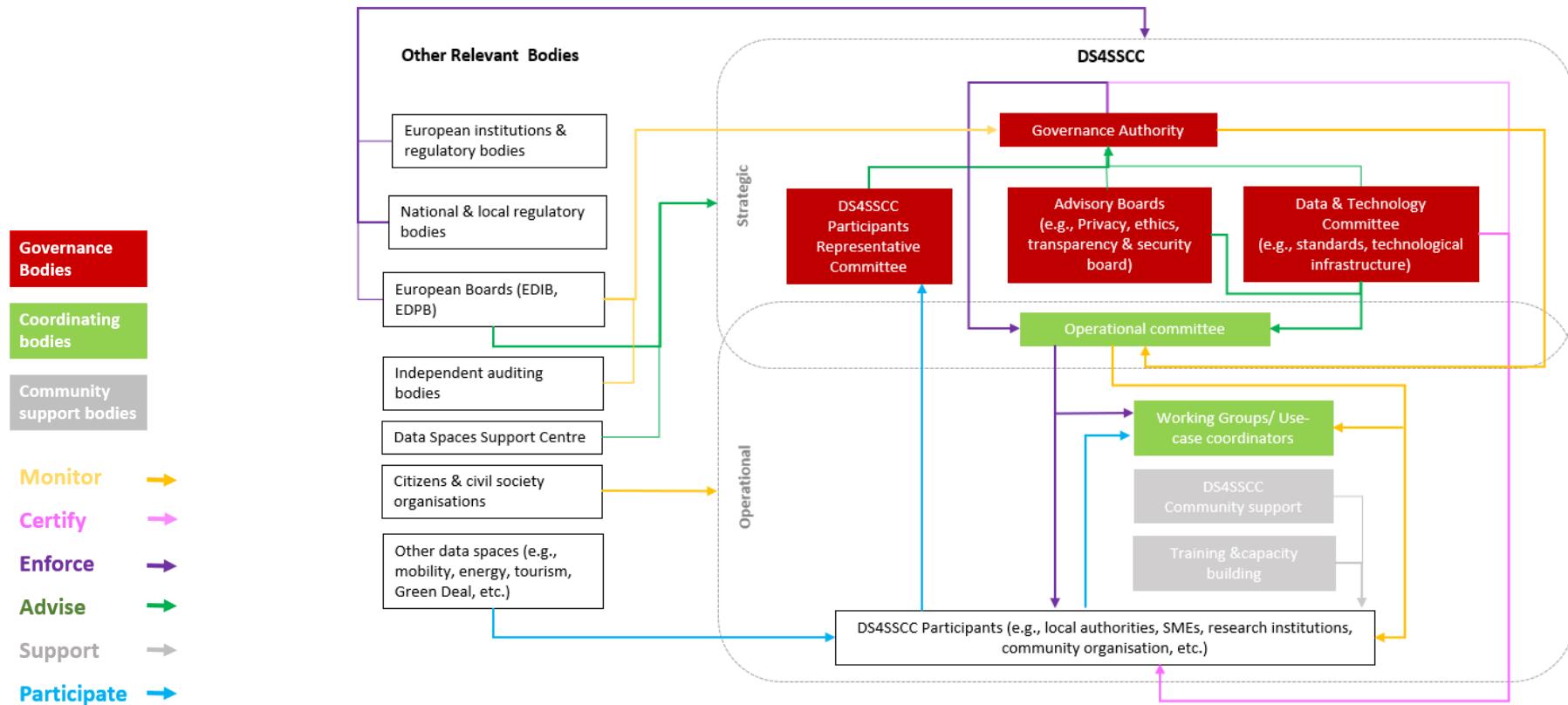


Figure 7: Possible structure for DS4SSCC governance

## 2.4. Governance framework

The governance framework is understood by the DSSC as the '*set of principles, standards, policies (rules/regulations) and practices that apply to the governance, management, and operations within a particular scope as well as to the enforcement thereof, and the resolution of any conflicts*'<sup>26</sup>.

In the context of the preparatory action for DS4SSCC, we explored governance frameworks at the two levels:

1. DS4SSCC including roles, responsibilities, governance structures and mechanisms.
2. DS4SSCC use-cases including how to set up multi-stakeholder cooperation which align with the DS's vision, principles, and governance rules (see section 3).

In this section, we lay out the governance structures and rules at the level of DS. In their work on [Governing the Environment Related Data Space](#), Fritzenkötter et al (2022,p.58) provided valuable insights by distinguishing **different types of governance** in terms of broad, mixed and narrow (see Figure 8). The broad governance calls for all DS4SSCC stakeholders whereas narrower governance structures with selected stakeholders can be used to take technical and operational decisions delivered through smaller-group processes.

Suited for broad governance	Suited for narrow governance
Agreeing on core values and principles	Decisions on technical and quality standards
Deliberating options for strategic development, in particular to determine fundamental approaches to data rights and ownership	Resource management and executive functions of a holding body/agency
Fundamental approaches to data rights and ownership	Decisions on guidance on appropriate forms of data management (e.g. collective management of data rights/data trusts)
Suited for mixed governance	
Review of processes	
Oversight of executive or agency functions	
Quality and process assurance	
Enforcement decisions	

Figure 8: Different levels of governance

Differentiating between types of governance helps define who needs to be involved, to what degree and via which governing bodies in relation to identified actions. Drawing on the work conducted as part of the DS4SSCC preparatory action, we have identified the different governance bodies (see Table 7) that need to be in place for the functioning of the DS. We have laid out the initial responsibilities of these bodies as well as their possible structure.

<sup>26</sup> DSSC Glossary:

<https://dssc.eu/space/Glossary/55443460/DSSC+Glossary+%7C+Version+1.0+%7C+March+2023>



Entities	Composition	Responsibilities
<b>Governance Authority</b>	Representation of all types of roles and stakeholders	Make decisions Approve/ certify new participants Enforce rules Monitor DS4SSCC operations (Operational Committee, WG, participants)
<b>DS4SSCC participants representative committee</b>	Representation of DS participants	Advise Governance Authority
<b>Advisory boards</b>	Different types of Advisory Boards incorporating relevant expertise (e.g., Privacy, ethics, security)	Advise Governance Authority
<b>Data &amp; technology committee</b>	Committee of experts and DS4SSCC representatives	Advise Governance Authority on technology, standards, etc Recommend/certify technologies/standards
<b>Operational Committee</b>	Representatives of WG, community support bodies, DS4SSCC participants representative committee	Monitor/ oversight of operational processes and respect of DS4SSCC rules by participants/WG Report to Governance Authority Enforce operational rules Coordinate support bodies with DS participants Communication with DS participants
<b>WG/ use-case coordinators</b>	Different types of working groups incorporating DS participants working on similar use-cases/ with similar technology	Coordinate use-cases
<b>DS4SSCC Community support</b>	Organisations with relevant technical / legal expertise	Communication Operational Support of DS participants
<b>Training &amp; Capacity Building</b>	Organisations with relevant training expertise	Upskilling, training, and capacity building of DS participants

Table 7: Governance bodies

Drawing on Fritzenkötter et al 2022 and the differentiated levels of governance, Table 8 mapped identified actions (e.g., ‘Agreeing on core values and principles’) and assigned each action to relevant data space participants and bodies according to the type of governance. For example, the action ‘Agreeing on core values and principles’ is understood as a broad governance matter and has been assigned to all with the supervision of the Governance Authority and the DS4SSCC participants representative committee.

Actions	Governance	Relevant bodies
Agreeing on core values and principles	Broad	All (led by Governance Authority & DS4SSCC participants representative committee)
Determine conditions for access, sharing, processing, and using data	Broad	All (led by Governance Authority & DS4SSCC participants representative committee)
Strategic Development & change management	Broad	Governance Authority, Advisory Boards, DS4SSCC participants representative committee, Data & Technology committee
Review of processes (Audits & monitoring)	Mixed	Governance board, Operational Committee, DS4SSCC participants representative committee
Enforcement	Mixed	EDIB, Governance Authority, Operational Committee
Certification	Mixed	EDIB, DSSC, Governance Authority, Data & Technology committee
Onboarding	Narrow	Operational Committee



Data/ technical quality and standards	Narrow	Data & Technology committee, DS4SSCC participants representative board. Advisory boards
Resource management	Narrow	Governance Board
Support & capacity building	Narrow	Operational Committee, Community support, Training & Capacity building
Provenance & traceability	Narrow	Governance Authority, Operational committee
Identity management	Narrow	Governance Authority, Data & Technology committee

Table 8: Types of actions and governance and relevant bodies

Following this work, we have sketched a first structure for the governance of DS4SSCC (see Figure 7).

## 2.5 Legal frameworks

Digital sovereignty and fair and trustworthy data sharing were identified as policy priorities of the European Commission under the agenda of ‘A Europe fit for the digital age<sup>27</sup>’ and with the publication of the *European Data Strategy* (2020). In practice, the creation and deployment of common European data spaces fit within an existing and emerging cross-sectoral regulatory ecosystem (see Figure 9).



Figure 9: Overview of European Strategy for Data

### 2.5.1. Regulatory ecosystem

DS4SSCC must comply with the existing and upcoming **cross-sectorial legislations related to non-personal and personal data** including the Data Governance Act; the Data Act; the Open Data Directive and the Implementing Act on High Value Datasets, the Regulation on the Free Flow of Non-Personal Data, the General Data Protection Regulation, and ePrivacy Directive (see Table 9).

Legislation/ regulation	Status
<u>Data Act</u> Proposal for a Regulation Of The European Parliament And Of The Council on harmonised rules on fair access to and use of data	Ongoing
<u>Data Governance Act</u> Proposal for a Regulation of the European Parliament and of the Council on European data governance	Completed, in force in Sept 2023
<u>ePrivacy Directive</u> Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector	In force
<u>ePrivacy Regulation</u> Proposal for a Regulation Of The European Parliament And Of The Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications)	Ongoing
<u>General Data Protection Regulation</u> General Regulation on data protection 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data	In force

<sup>27</sup> [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_20\\_273](https://ec.europa.eu/commission/presscorner/detail/en/ip_20_273)



<a href="#"><u>Implementing Act on High-Value Datasets</u></a>	Commission Implementing Regulation (EU) 2023/138 of 21 December 2022 laying down a list of specific high-value datasets and the arrangements for their publication and re-use	In force
<a href="#"><u>Open Data Directive</u></a>	Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information	In force
<a href="#"><u>Regulation on the Free Flow of Non-Personal Data</u></a>	Regulation (EU) 2018/1807 of the European Parliament and of the Council of 14 November 2018 on a framework for the free flow of non-personal data in the European Union	In force

Table 9: EU cross-sectorial legislation related to non-personal and personal data

The DGA and DA are particularly relevant in the context of DS4SSCC. The DGA aims to (1) promote the fair reuse of certain categories of protected data held by public sector bodies; (2) foster the creation of data intermediation services, and (3) facilitate data altruism understood as a voluntary donation of data by entities, individuals, or organisations that make data available for the common good. Finally, it also supports the creation and development of common European data spaces.

The DA aims at maximising the value of data by ensuring that a wider range of stakeholders (including citizens) gains control over their data in B2B, B2G and B2C contexts and that more data is used to generate innovation and boost the digital economy. The text gives public sector bodies the right to access and use private sector data in situations of public emergency, for implementing a legal mandate and for reducing the administrative burden in cities as well as introduces the possibility of sharing data with third parties and new rules for allowing cloud switching between cloud providers. These provisions would allow local authorities to gain access to data that could be used to develop data-driven innovative services in the city, such as for mobility, climate transition and urban planning purposes.

DS4SSCC stakeholders have identified several **areas of uncertainties** in the different cross-sectorial legislations related to data provision:

- Interpretation of 'data intermediation services' in DGA

Data intermediation services are defined in Article 2 and 10 of the DGA while article 10 further elaborates the possible forms of data intermediation services<sup>28</sup>. The key area of uncertainty centres on the concept of neutral third parties. In their report *Mapping the Landscape of Data Intermediaries*<sup>29</sup>, Micheli et al (2023, pp.21-25, Figure 10) provides a clear overview of this conception of data intermediation services:

<sup>28</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R0868>

<sup>29</sup> <https://publications.jrc.ec.europa.eu/repository/handle/JRC133988>



### Box 3. The concept of neutrality in the Data Governance Act

The Data Governance Act only concerns 'neutral' data intermediation services providers. The term 'neutral' refers to two cumulative criteria data intermediaries have to meet in order to have to register according to the DGA:

- **Structural separation.** A legal entity considered to be a data intermediary can only provide data intermediation services. Hence, if it provides data-driven services beyond intermediation such as data analytics, it should do so through a separate legal entity.
- **Non-exclusivity.** The data intermediation service provided by a data intermediary should be open to any third party that respects the terms and conditions of the intermediary and the legal framework.

If these criteria do not apply, the entity will not have to register and thus will not be recognised as a neutral data intermediation services provider in the EU and able to register under the DGA.

*Figure 10: Concept of neutrality, DGA*

Furthermore, Micheli et al (2023, p.27, Table 10) provide an overview of the criteria for data intermediaries and data altruist organisations to comply with DGA. While this helps clarifying some of the legal aspects of data intermediaries and data altruism organisations, practical questions remain including:

1. How many intermediaries do we want at national and European levels?
2. What level should they function at (national, sectorial, etc)?
3. How can you make sure that it is not the private interest that is overruling these intermediaries?
4. How do we involve citizens and communities in intermediaries (representation / participation)?



	Providers	Data suppliers	Purposes for data sharing
<b>DISPs</b> <i>Data intermediation services providers recognised in the Union</i>	<ul style="list-style-type: none"><li>● Providers of a service which aims to establish commercial relationships for the purposes of data sharing between data subjects/holders and data users through technical or legal means.</li><li>● Neutral third parties (structural separation between data intermediation services and any other data-driven services).</li></ul> <p>DISPs do not include:</p> <ul style="list-style-type: none"><li>● services that aggregate, enrich or transform data for adding value;</li><li>● services that focus on the intermediation of copyright-protected content;</li><li>● services that are exclusively accessed by one data holder;</li><li>● data-sharing services offered by public sector bodies that do not aim to establish commercial relationships;</li><li>● data altruism organisations.</li></ul>	Data holders	<ul style="list-style-type: none"><li>● Bilateral or multilateral exchanges of data;</li><li>● creation of platforms or databases enabling the exchange or joint use of data;</li><li>● establishment of other infrastructure for the interconnection of data holders with data users.</li></ul>
<b>RDAOs</b> <i>Data altruism organisations recognised in the Union</i>	<ul style="list-style-type: none"><li>● Entities operating on a not-for-profit basis enabling the voluntary sharing of data for objectives of general interest (e.g., healthcare, fighting climate change, official statistics, improving mobility and public services, enhancing public policy making and research).</li><li>● Complying with Rulebook, meeting transparency requirements, and offering specific safeguards.</li></ul>	Groups of data holders or data subjects <sup>19</sup> (Members of data cooperatives)	<p>Support members in the exercise of their rights over their data, with regard to:</p> <ul style="list-style-type: none"><li>● making informed choices before they consent to data processing;</li><li>● exchanging views on data processing purposes and conditions that best represent the interests of its members;</li><li>● negotiating terms and conditions for data processing on behalf of its members.</li></ul>

Source: JRC own elaboration with contribution of Viivi Lähteenoja

Table 10: DGA provision for data intermediaries and altruism organisations

- Lack of clarity on DA Art 15 on data sharing in public emergencies and exceptional situations to access private sector data

According to the text ‘This primarily concerns public emergencies, but also other exceptional situations where compulsory business-to-government data sharing is justified, in order to support evidence-based, effective, efficient, and performance-driven public policies and services’<sup>30</sup>.

<sup>30</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A68%3AFIN>



Remaining questions include:

- how would it work in practice (timeliness, who enforces it)?
- How broad is the scope of data of public interest?

The questions highlighted here have informed some of the recommendations put forward in Section 4.

Other relevant **cross-sectorial regulations** to consider when it comes to data sharing and re(use) include Artificial Intelligence, Digital Identity, Cybersecurity, Intellectual Property Rights, Interoperability and Platforms and Digital Services (see Table 11). These regulations intersect with different components of data exchanges.

Legislation/ regulation	Status	
<a href="#">Artificial Intelligence Act</a>	Proposal For A Regulation Of The European Parliament And Of The Council Laying Down Harmonised Rules On Artificial Intelligence (Artificial Intelligence Act) And Amending Certain Union Legislative Acts	Ongoing
<a href="#">AI Liability Directive</a>	Proposal for a Directive Of The European Parliament And Of The Council on adapting non-contractual civil liability rules to artificial intelligence	Ongoing
<a href="#">Copyright in the Digital Single Market Directive</a>	Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC	In force
<a href="#">Cybersecurity Act</a>	Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013 (Cybersecurity Act) (Text with EEA relevance)	In force
<a href="#">Digital Markets Act</a>	Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828	In force
<a href="#">Digital Services Act</a>	Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC	In force
<a href="#">eIDAS</a>	Regulation 910/2014 on electronic identification and trust services for electronic transactions in the internal market	In force
<a href="#">Interoperable Europe Act</a>	Proposal for a Regulation of the European Parliament and of the Council laying down measures for a high level of public sector interoperability across the Union	Ongoing
<a href="#">NIS2 Directive</a>	Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union	In force
<a href="#">Platform-to-Business Regulation</a>	Regulation (EU) 2019/1150 of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services	In force

Table 11: Other relevant EU cross-sectorial regulations

DS4SSCC must also comply with EU Competition policies and regulations to promote fair commercial and competition practices (e.g., Antitrust legislation<sup>31</sup>, Consumer

<sup>31</sup> [https://competition-policy.ec.europa.eu/antitrust/legislation\\_en](https://competition-policy.ec.europa.eu/antitrust/legislation_en)



protection law<sup>32</sup>, Consumer contract law<sup>33</sup>, Public procurement rules and legislations<sup>34</sup>.

**National and local specific frameworks** need also to be taken into account. For example, the French Law for a Digital Republic ('*Projet de loi pour une République numérique*'<sup>35</sup>) adopted in 2016 mandates companies operating under public service delegation (e.g., utilities, transportation) to publish their data. France also adopted a law on Energy Transition and Green Growth (2015), which compels energy distributors to publish local energy consumption data (see Chignard & Glatron, 2023). Furthermore, it is important to note that national and European regulations are fragmented and thus can create legal tensions. For example, Cologne is building a cross-partner data infrastructure with common governance principles called KUDOS (Kölner Urbanes Daten OkoSystem) and is using public procurement to secure the technical infrastructure. However, they had to reconcile the needs to comply with German cyber security certification which is a level higher up than the EU standard (ISO27001).

Finally, the legal framework of DS4SSCC will be informed by relevant **sector policies and regulations according to specific use-cases**. For example, National Data Access Points have been established to facilitate access, easy exchange and reuse of data in the transport sector<sup>36</sup>.

These examples show that it is crucial to map the sector and national/local legal contexts to leverage the regulatory and policy instruments which already exist.

---

<sup>32</sup> [https://commission.europa.eu/law/law-topic/consumer-protection-law\\_en](https://commission.europa.eu/law/law-topic/consumer-protection-law_en)

<sup>33</sup> [https://commission.europa.eu/law/law-topic/consumer-protection-law/consumer-contract-law\\_en](https://commission.europa.eu/law/law-topic/consumer-protection-law/consumer-contract-law_en)

<sup>34</sup> [https://single-market-economy.ec.europa.eu/single-market/public-procurement/legal-rules-and-implementation\\_en](https://single-market-economy.ec.europa.eu/single-market/public-procurement/legal-rules-and-implementation_en)

<sup>35</sup> <https://www.wipo.int/wipolex/en/legislation/details/18412>

<sup>36</sup> [https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/road/action-plan-and-directive/national-access-points\\_en](https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/road/action-plan-and-directive/national-access-points_en)



## 2.5.2. Contractual agreements

Following the legal frameworks highlighted in the previous section, DS4SSCC could consist of several types of contractual agreements as stated in Table 12.

Contractual relationships <sup>37</sup>	Data Holder	Data Provider	Data User	Use-Case Participant	Data Intermediaries	Governance Bodies	Orchestrator/Coordinating Entity	Community Support Bodies
General agreement or constitutive agreement						✓	✓	✓
Status of Governance body and legal entity						✓		
Membership agreements (incl. T&C)	✓	✓	✓	✓	✓			
Service-level agreements for services offered within the data space		✓			✓			
Contractual terms concerning switching between providers of data processing services					✓			
Specific data sharing agreements in DS4SSCC use-cases	✓	✓	✓	✓		✓		

Table 12: Possible contractual relationships in DS4SSCC

<sup>37</sup> From DSSC public consultation on the contractual building block:

<https://dataspacessupportcentre.atlassian.net/wiki/spaces/ELFFDS/pages/142901354/PUBLIC+CONSULTATION+-+31+08+2023+-+Contractual+framework+building+block+-+Description+v0.5>



### 3. Developing Multi-Stakeholder Data Cooperations

#### 3.1. The Data Cooperation Canvas

The Data Cooperation Canvas (Figure 11) was co-developed during the preparatory action for DS4SSCC. It was built drawing on the exchanges in WP2 which provided a range of use-cases with different configurations of stakeholders/partners, data sharing and business models and with different governance practices that were put in place to ensure fair and trustworthy data exchanges.

The cooperation canvas **focuses on specific use-cases**. This is key as it allows partners and stakeholders to clearly identify the needs for data sharing, define its purpose as well as lay out the different components (technical, governance, business models, implementation) that are required to ensure the success of the cooperation. The canvas is divided into **three main parts** providing

- The context of the cooperation ('Why')
- The governance and business models underlining the cooperation ('Organisational')
- The technical aspects of the cooperation ('Data & Technical')

Each part contains subsections to describe the characteristics of the cooperation alongside guiding questions (see Table 13). You can find some detailed examples of the technical part of the data cooperation canvas in D3.2 Architecture Model.

The canvas is a tool which can be used in several ways:

1. to explore and define multi-stakeholder cooperation focusing on a specific use-case;
2. to describe existing multi-stakeholder cooperation and reflect on the enablers and obstacles of data exchange;
3. to understand at one glance the added value of cooperation between different types of stakeholders;
4. to foster trust between stakeholders by clearly setting up the cooperation
5. to capture a body of knowledge on multi-stakeholder cooperations and create a DS4SSCC use-case repository.

Finally, Governance Group participants flagged that it could be used as part of the contracting processes for data sharing. This could be further explored during the deployment phase of DS4SSCC.



Guiding questions		Sections
<b>Why</b>	What is the purpose of the data exchange? What are the outcomes envisioned for the data exchange? What is the scope of the data exchange? What is out of scope? What is the context that creates the opportunity/necessity for data exchange? Why will this data exchange succeed? What is the added value for participants? What is the motivation for the key partners to join the data exchange?	3.2.1 3.2.2
<b>Who</b>	Who will be the partners in the initiative? How (much) would they contribute? Who will be interested in / able to participate? How many participants will the exchange have? What are the “dream participants”? Are there other organisations that also want to share the same kind of data? What key roles are needed to sustain the cooperation? What rights and responsibilities are associated with these roles? What will be the data intermediary organisation (if any)?	3.2.2
<b>What</b>	What types of data will the data exchange involve? What organisation will share what data when? What is the provenance/source of the datasets? What is the data quality (e.g., format, standards, etc.)? What organisational resources are required for this data cooperation? What resources are available already? What needs to be done to get all required resources? What steps are performed as a shared process in the data exchange? What steps are done individually? How can the data be uniformed/standardised/combined? What shared concepts, languages, formats, or methods can be used? What data standards & formats are used or need to be used? What technical concepts or models need to be in place for the data exchange. What MIMs are implemented and how are they implemented? What technical infrastructure is needed for the data exchange?	3.2.3 3.2.4 3.2.5  See also <a href="#">Catalogue of Specifications</a> & D3.2. Architecture Model
<b>How</b>	What will the long-term business model of the exchange look like? How should the value created be distributed? What are the costs of the data exchange? Who is paying? What are the revenues? Who is profiting? What compensation, fees or other financials are needed? How are decisions made? What operational processes/ mechanisms should be in place? (e.g., monitoring, accountability, certification, clearance, conflict resolution, termination, etc.) What are the most appropriate contractual agreements? What are the relevant local/national/European frameworks to consider? How will the data exchange be implemented and sustained over time?	3.2.5 3.2.6 3.2.7 3.2.8

Table 13: Data Cooperation Canvas- Guiding Questions

All the components of the canvas will form the **business model for the data cooperation** (including the value proposition (why), the partners and targeted customers (who), the types of data exchanged, and technical infrastructure used (what) and the resources and mechanisms required to deliver and sustain value (how)).

The canvas was first iterated by *Braxwell.com* in the role of external experts' strategic data partnerships of the City of Amsterdam's Directorate Digitalization & Innovation and members of the Governance Group. It was further developed during bilateral exchanges as well as discussions with WP3 and WP4 to ensure alignment with the technical and implementation work which was developed by them. The canvas was revised repeatedly to incorporate feedback. It was then presented, further



developed with, and validated by the Governance Group during an interactive workshop in June and by the broader stakeholders during the Stakeholder Forum meetings in June and July. (see Appendix 4 for a detailed overview of the methodology).

## 3.2. Filling the canvas

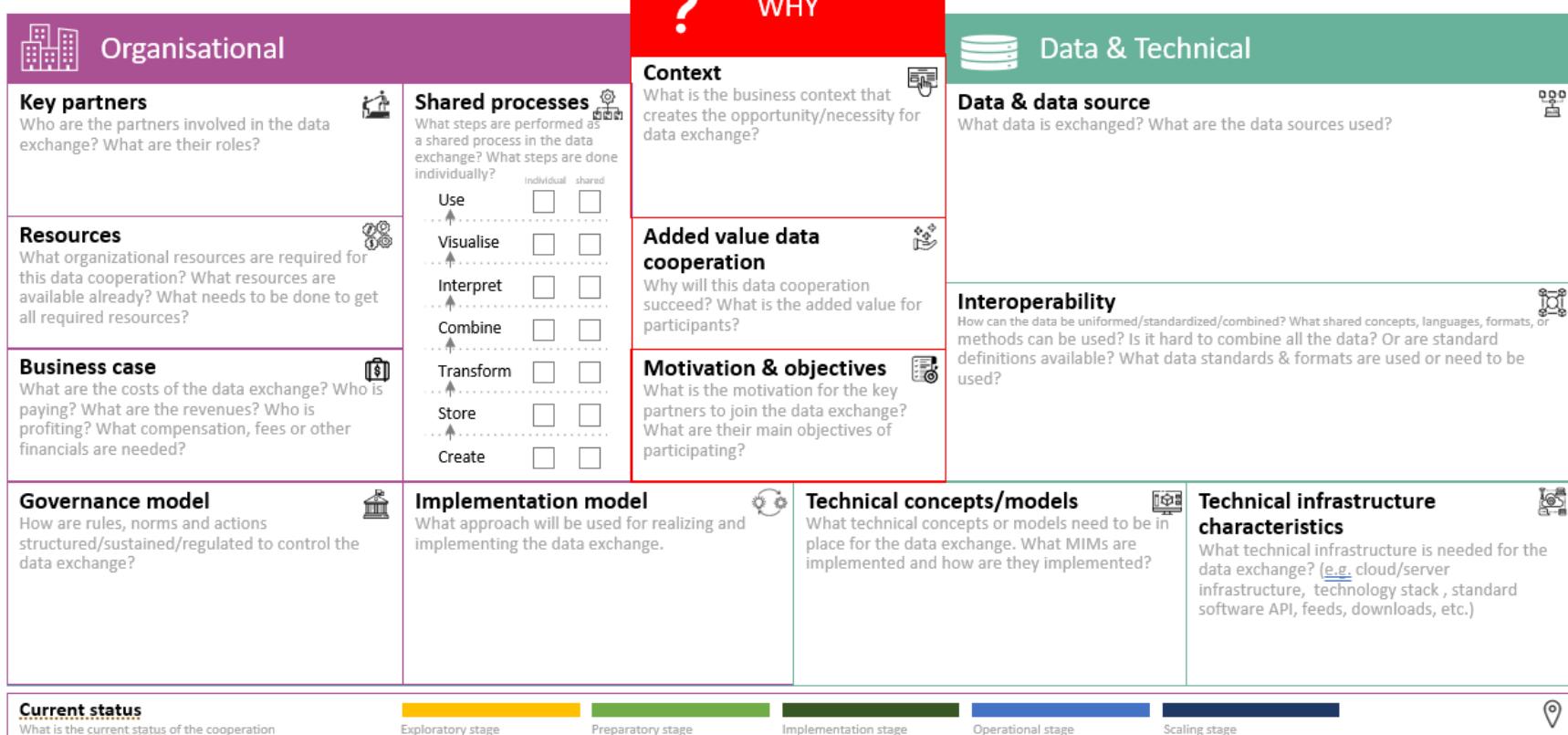
### 3.2.1. Define objectives & identify value proposition

Before starting a cooperation on data sharing between stakeholders, it is crucial to understand the **local context** which creates a **specific need** for data exchange; and clearly define and agree on the **objectives and the scope** of the cooperation (see Table 14 for examples from WP2 use-cases). The ‘Why’ part of the canvas focuses on the context, added value and motivations and objectives of the cooperation. This part should be filled up first.

To do so, it is important to keep the following elements in mind:

- Identify specific challenge/ question (local/ policy need) to solve rather than with data
- Define specific and measurable objectives in relation to the challenge. If the cooperation meets these objectives, it will act as a **proof of concept**. The objectives should be **concrete, relevant for all stakeholders and driven by local needs** (and not only by the desire to share and/or get data). This will ensure buy-in by relevant stakeholders.
- Establish the **value proposition** of the cooperation (e.g. reduction transaction costs, increase of data quality, provision of new data services).
- Devise the cooperation to be a **win-win situation** for all involved. This may require reaching a compromise; however, it is key for the cooperation to be successful that every partner obtains an added value from it.
- Market-driven incentives (e.g., monetarisation, service provision) are important incentives for cooperation. However, it is also crucial to explicitly articulate other types of incentives (i.e., organisational, and societal) (see Table 15). **Societal incentives** are at the heart of the DS4SSCC’s shared vision and as such need to inform the data cooperation.
- While the initial scope and objectives of the cooperation should be narrow, it is important to work on a **long-term concept that can be scaled up**.

# Data Cooperation Canvas



This work is licensed under Creative Commons Attribution-Share Alike 3.0 Unported License. To view a copy of this license, visit:  
<http://creativecommons.org/licenses/by-sa/3.0/> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.

 **City of Amsterdam / Braxwell.com**  
 This work has been conceived as part of the preparatory actions for the Data Space for Smart and Sustainable Cities and Communities (DS4SSCC). The canvas was developed by Ron van der Laan and Jasper Soetendaal of Braxwell.com In the role of external experts strategic data partnerships of the Directorate Digitalization & Innovation of the City of Amsterdam and has been further developed with and validated by other participants of DS4SSCC working groups.

Figure 11: Data Cooperation Canvas



Name & Coordinator	Context	Motivations & objectives	Value proposition
<b>IDEA</b> City of Amsterdam	Road authorities (local and national) have open data on road works. This data about the planned road works may differ from the actual road works due to, for example, subcontractors.	Service providers and road authorities want to have data on actual road works. By validating the planned road works, using live data (from floating car data (FCD)), IDEA generates a high quality, real-time data feed for road works.	<ul style="list-style-type: none"><li>• Providing high-quality, real-time data on road works.</li><li>• Service providers can provide better information to road users.</li><li>• Road authorities have insight into their roadworks' actual impact. For example, to check on subcontractors.</li></ul>
<b>LxDataLab Mobility</b> Lisbon City Council	Lisbon city council aims to broaden the use of mobility data from different sources to better understand the mobility patterns in the city and create solutions to enhance planning, safety, operations, and emergency management connected to mobility (e.g., event management, road traffic, etc).	The Lx Data Lab cooperation aims to reuse the data that Lisbon City Council collects, produces and purchases (e.g., Vodafone), and to develop tools for internal uses and research (e.g., prediction model of uses of shared bikes).	<ul style="list-style-type: none"><li>• Tailored and need-based projects which provide input for day-to-day operations and decision-making of the city council.</li><li>• Use of data for research purposes.</li><li>• Citizen participation.</li></ul>
<b>DataCity Lab</b> Barcelona City Council	Barcelona has developed an energy strategy (SEAP) which aims to use 100% renewable energy, with zero emissions and reduce energy poverty.	The cooperation aimed to use data to evaluate the potential of photovoltaic panels on public buildings in three neighbourhoods of Barcelona (i.e., Poblenou, La Marina and Vila de Gràcia) and in turn inform the creation of Energy Communities.	<ul style="list-style-type: none"><li>• Development of a visual tool for city use which can support decision making in terms of energy transition and the development of energy communities.</li><li>• Acciona and ImpactE also benefit from the creation of such a tool and can share it with other local authorities.</li></ul>
<b>Rubi Brilla</b> Rubí City Council	Rubi City council has committed to sustainable energy management as a long-term strategy. In this context, the city has developed Rubí Brilla which aims to reduce city energy consumption, accelerate the transition to renewable energy and empower citizens and companies to make meaningful and informed changes in terms of energy consumption.	The aim of the project is to combine energy data from different sources to reduce energy poverty, optimise energy consumption in the city and inform citizens about energy.	<ul style="list-style-type: none"><li>• Inform Local Policy design and evaluation.</li><li>• Provide personalised services to individuals and collectives (energy communities).</li><li>• Opening (integrated data outputs) to citizens and stakeholders (market creation) and to society (creation of knowledge of general interest, generalisation of knowledge).</li></ul>

Table 14: Context, Objectives and Value Propositions of WP2 Use-Cases

	<b>Cities &amp; Local authorities</b>	<b>Private sector</b>	<b>Academia</b>	<b>Civil Society</b>
<b>Monetary/ Market-driven</b>	<p>Costs sharing (e.g., reduce data storage compliance costs, lower costs of development &amp; implementation, saving time and money by sharing burden).</p> <p>Resources sharing (e.g., capacities, capabilities, skills, infrastructures, etc).</p> <p>Development of new products &amp; services (Combining data sources to improve services/ optimise services/ develop new ones).</p> <p>Enabling joint innovation.</p> <p>Scaling up</p>	<p>Provider of technical and digital solutions for smart cities (platforms, SaaS, data as a service, visualisations, analytical tools, etc.).</p> <p>Enabling markets for both data products and solutions based on data.</p> <p>Increased visibility and distribution of services.</p> <p>Finding new partners/ clients, expanding the EU market.</p> <p>Test &amp; deploy new services/ infrastructures.</p> <p>Test deployment possibilities with cities.</p> <p>Development of new products &amp; services (Combining data sources to improve services/ optimise services/ develop new ones).</p> <p>Enabling joint innovation.</p>	<p>Enabling joint innovation</p> <p>Development of new products &amp; services</p> <p>(Combining data sources to improve services/ optimise services/ develop new ones).</p>	<p>Enabling joint innovation</p> <p>Development of new products &amp; services</p> <p>(Combining data sources to improve services/ optimise services/ develop new ones).</p>
<b>Organisational</b>	<p>Access to new sources of high-quality data</p> <p>Internal data discoverability (Vision about available datasets, Providing data and finding consumers for data improves your internal processes).</p> <p>Early access to specifications and state of the art technology.</p> <p>Data standardisation (incl. data quality improvement).</p> <p>Access to funding (e.g. DS4SSCC Deployment call).</p> <p>Sharing methods/processes to ensure legal compliance (e.g. reduce costs of making processes and data GDPR compliant and reduce risks of GDPR breaches).</p> <p>Reputational (i.e., using data for common good).</p> <p>Align with EU standardisation &amp; digital infrastructure and be part of the EU digital single market.</p> <p>Exchange experience about specific use-cases (i.e. Learning from other stakeholders in the ecosystem, especially frontrunners sharing knowledge/experience/practices with less mature players).</p> <p>Benefit from technical or legal expertise.</p>	<p>Access to new sources of high-quality data.</p> <p>Help define and establish Data Sharing Agreements and Standards.</p> <p>Reputational (i.e., using data for common good).</p> <p>Align with EU standardisation &amp; digital infrastructure and be part of the EU digital single market.</p> <p>Identification of gaps (data services) and creation of opportunities.</p> <p>Data exploration/ discovery.</p>	<p>Access to new sources of high-quality data for research purposes.</p> <p>Access to funding.</p> <p>Part of broader ecosystem/contact with future partners.</p>	<p>Control of personal data</p> <p>Access to new sources of high-quality data.</p> <p>Better services</p> <p>Participation in data stewardship and local data initiatives to ensure relevance/ public benefit.</p>



**Societal**

Improvement of services provision for citizens.  
Making more use of data that is collected using public resources for value to flow back to society (businesses, citizens).  
Use data for research.  
Data-driven decisions and policy making (e.g., planning, operations & emergency management, safety, mobility).  
Align with Green Deal objectives.  
Empowering citizens & communities.

*Table 15: Incentives per type of stakeholders*

### 3.2.2. Identify key partners & roles

Once the objectives and added value proposition have been defined, the next step is to undertake a **comprehensive mapping of the relevant stakeholders** in the context of the use-case and cooperation envisioned above. A number of tools can enable you to conduct this exploratory exercise including the ODI Data Ecosystem Mapping Tool<sup>38</sup> or Adaptation Scotland's Stakeholder and Power Mapping Tool<sup>39</sup>

During this stage, it is important to keep the following elements in mind:

- Distinguish between **initial partners** of the cooperation and **broader stakeholders** (see Table 16).
- Select carefully initial partners for the first phases of the cooperation, they need to be willing to **put time/resources for the initial push of the cooperation**.
- When it comes to development and service partners; be particularly **careful with vendor lock ins and ownership of products developed**
- Network with a **minimum number of partners** while ensuring that all required roles for the objectives to be met are fulfilled. Every partner should play a very distinctive role in the initial partnership (see roles Table 5 and template Table 17)
- Start with limited collaboration and small steps. New members can be added to the team once the proof of concept is validated.
- Use **independent third-party intermediaries** to instil trust in the exchange (e.g., universities, personal data stores) and secure the skills needed (e.g. data quality partners, universities)
- Explore within a municipality where a data intermediary could fulfil a role
- Ideally, there should be big and medium/small local authorities. When relevant it is important to incorporate different levels of governance (e.g. metropolitan, regional, etc.). This will ensure scalability and future adoption.
- Ideally, **involve end-users and citizens** from the outset and throughout the process<sup>40</sup>. To do so, build on existing community networks and develop partnerships with organisations that are already conducting work with communities and can act as trusted gatekeepers.

---

<sup>38</sup> <https://www.theodi.org/article/data-ecosystem-mapping-tool/#1675181030992-dc81419a-f150>

<sup>39</sup> <https://www.adaptationscotland.org.uk/how-adapt/tools-and-resources/stakeholder-and-power-mapping-template-workshop-outline>

<sup>40</sup> See Ada Lovelace Institute, Participatory data stewardship. A framework for involving people in the use of data, 2021. <https://www.adalovelaceinstitute.org/report/participatory-data-stewardship/>



Name	Partners & Stakeholders			
	Public administrations & institutions	Private sector	Academia & Research Institutions	Civil Society
IDEA	<b>The City of Amsterdam</b> <b>Municipality of The Hague</b> <b>Province of North Holland</b> <b>National Road Authority (Rijkswaterstaat)</b> <b>National Data Access Point (NDW)</b>	<b>Three technology SMEs</b> BeMobile Other navigation service providers (TomTom, Google, etc)		Citizens
LxDataLab Mobility	<b>Lisbon City Council</b> CARRIS (City bus operator) EMEL (City parking & mobility company)) IPMA (Instituto Português do Mar e da Atmosfera) AMA (Agency for Administrative Modernization)	Waze Vodafone	<b>Private &amp; Public Higher Educational Institutions (e.g. Instituto Universitário de Lisboa (ISCTE IUL), Universidade Nova de Lisboa (UNL FCT, NSBE), Instituto Superior Técnico (IST), Nova Management Information School (NOVA IMS))</b>	<b>World Data League</b> Citizens
DataCity Lab	<b>Barcelona City Council</b> Other local authorities (e.g. Rubí City Council, El Prat de Llobregat)	<b>Data City Lab</b> Acciona ImpactE Endesa	University of Barcelona	Citizens
Rubi Brilla	<b>Rubí City Council</b> Other local authorities (e.g., Barcelona City Council, El Prat de Llobregat, Granollers, Mataró, Viladecans) CNMC (National Markets and Competition Commission)	PSIG Pylon Data eDistribucion		Citizens

Table 16: WP2 Use-cases partners & stakeholders  
(Bold font: main partners/ Light font: broader stakeholders)

Roles	Participatory	Partner 1	Partner 2	Partner 3	Etc.
Participatory	Data Holder				
	Data Provider				
	Data User				
	Use case Participant				
Intermediary	Intermediation services				
	Personal data intermediaries				
Governing	Decision-making (Governance bodies)				
	Orchestrator/coordinating entity				
	Support & Capacity building				

Table 17: Template mapping initial partners & roles

See appendix 4 (Tables 1, 3, 4 & 5) for the mapping of partners and roles in WP2 use-cases.



### 3.2.3. Identify data types & sources

While setting up a data cooperation, it is critical to identify the **specific datasets** that will be used (see Table 19 for example from WP2 use-cases) and draw a clear **data profile for each** (see Table 18). In doing so, it is key to remember that the distinction between personal and non-personal data is blurry. Here the taxonomy developed by the OECD (2019, np.) provides a useful framework (see Figure 12). They define three broad domains – personal, private, and public – and show how the domains overlap as well as how they are typically subject to different legal and governance frameworks such as privacy, data protection regulation, competition and property rights.

*'the **personal domain**, which covers all personal data "relating to an identified or identifiable individual" for which data subjects have privacy interests,*

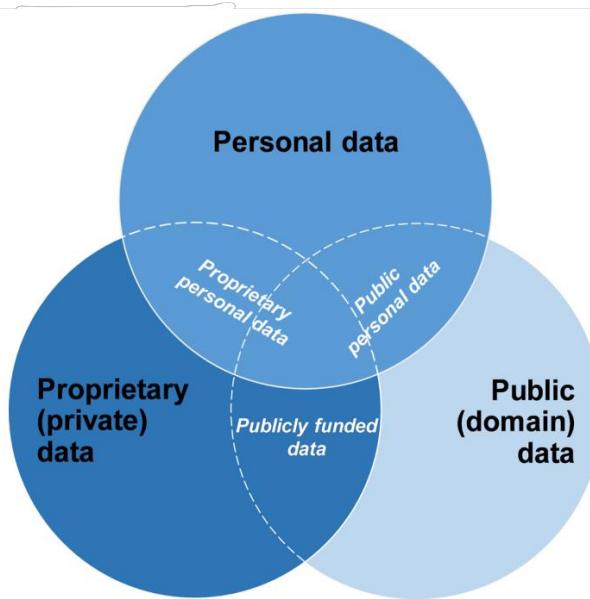


Figure 12: The personal, private and public domains of data

*the **private domain**, which covers all proprietary data that are typically protected by IPRs (including copyright and trade secrets) or by other access and control rights (provided by e.g. contract and cyber-criminal law), and for which there is typically an economic interest to exclude others,*

*the **public domain**, which covers all data that are not protected by IPRs or any other rights with similar effects, and therefore lie in the "public domain" (understood more broadly than to be free from copyright protection), thus free to access and re-use'. (OECD: 2019, np, figure 2.2 in the report).*

Creating clear dataset profiles allows partners to **understand the opportunities and assess the risks** in data sharing as well as the steps needed to share the data as specified (e.g., data cleaning/formatting, set-up of API, etc), see next section.



Dataset profile	Description
Types/ Domains	Personal/Public/Private domains
Source/ provenance	Public sector, private sector, citizen-generated, sensors, research
Format	Data & Technical standards ( including meta-data documentation, level and methods of aggregation and anonymisation)
Access rights <sup>41</sup>	Restricted, Shared, Open
Specifications	Granularity required (see example mobile phone data specifications Appendix 3)
Quality	Accuracy, completeness, consistency, timeliness, uniqueness, and validity.
Risk assessments	DPIA, Data ethics assessment, Data maturity assessment <sup>42</sup>

Table 18: Dataset profile

In addition, it is essential to follow the principle of **data minimisation** enshrined in GDPR's article 5(1)(c) which states that personal data shall be: "adequate, relevant and **limited to what is necessary in relation to the purposes for which they are processed**'. While it is key to follow this principle for legal compliance, it is also *pragmatic* to do so. Indeed, in some cases, stakeholders might be focusing on getting access to as much data as possible (foreseen future opportunities) rather than identifying the exact categories of data that are required to address the challenge. This can lead to lengthy and unnecessary discussions with data owners and thus delays in accessing the relevant data.

Name	Provenance	Domain(s)	Datasets
IDEA	One national service provider (BeMobile)	Proprietary personal data (purchased)	Floating Car Data
	Local, regional, and national road authorities	Public domain data (open)	Planned dates and details for road closures and construction works
LxDataLab	Lisbon city council	Public domain data (open)	Road network data: <a href="https://dados.cm-lisboa.pt/dataset/rede-viaria-escala-1-20000">https://dados.cm-lisboa.pt/dataset/rede-viaria-escala-1-20000</a>
	Vodafone	Proprietary personal data (purchased)	Mobile phone data: organised per grid of 156X156 metres (minimum 10 devices, every 15 min) total of devices, Total of different devices, Permanence and crossing grid, Exit and entering the city (11 entry points), Top 10 of roaming.
	Waze	Proprietary personal data	Floating car data Traffic Jams, Reason of traffic jams, trusted Waze messages

<sup>41</sup> See ODI, Data Spectrum: <https://www.theodi.org/about-the-odi/the-data-spectrum/>

<sup>42</sup> Useful resources include Bahim et al 2020, ODI, Assessing risks when sharing data: <https://www.theodi.org/article/assessing-risk-when-sharing-data-a-guide/>, ODI Data ethics maturity model: <https://www.theodi.org/article/data-ethics-maturity-model-benchmarking-your-approach-to-data-ethics/>



	CARRIS	Public domain data (open)	Bus routes, stops, frequencies: <a href="https://transitfeeds.com/p/carris/1000">https://transitfeeds.com/p/carris/1000</a>
	EMEL	Public domain data (open)	Parking occupation, Bike Stations, Availability of bikes, Space in stations: <a href="https://emel.city-platform.com/opendata/">https://emel.city-platform.com/opendata/</a>
	IPMA	Public domain data (open)	Weather data: temperature, precipitations, humidity per weather station
<b>DataCity Lab</b>	Barcelona city council	Public domain data (open) Proprietary personal data	Social services data, CRM data, Population statistics, Public building/public spaces characteristics, geospatial data
	Municipalities (El Prat & Rubí)	Proprietary personal data	Anonymized energy consumption data/patterns of individuals/families to develop the algorithm
	Datadis	Public domain data (open) Proprietary personal data	Energy consumption per postcode
	Endesa	Proprietary personal data (donated)	Monthly consumption per building
<b>Rubi Brilla</b>	Rubi city council	Public domain data (open) Proprietary personal data	Geospatial data (land register) Population register, Fiscal Registers (Real Estate Tax, Mechanical Traction Vehicle Tax). Electronic administrative files: Rehabilitation licences, photovoltaic installations. Individual smart meter data (Informed Consent for Access to Personal Data through Rubí Brilla website)
	Datadis	Public domain data (open) Proprietary personal data	Energy consumption per postcode. Power data: One record for each CUPS (Universal Supply Point Code) and month. Maximum power per month, day and hour of the maximum, demanded power. Consumption data: A record per CUPS per day & hour. Day, hour, kWh
	Citizen	Proprietary personal data	Smart meter data

Table 19: WP2 Use-cases datasets



### 3.2.4. Define shared data flows

As well as identifying the data types and sources that will be required in the cooperation, it is crucial to determine the **steps needed in the transformation of data throughout the lifecycle of data in the cooperation** (e.g., data creation, storage, processing, analysis, visualisation, and use). It will then support partners to decide which of these processes will be shared or done individually and allocate them.

In Figure 13, we provided an overview of **typical data flow processes** that often need to be undertaken to exchange and generate value from data safely and ethically. This overview can support partners to map and establish the activities needed to process and reuse the different datasets identified in the previous step. It also enables to clearly identify the type of outputs shared (raw data, aggregated data, information, service).

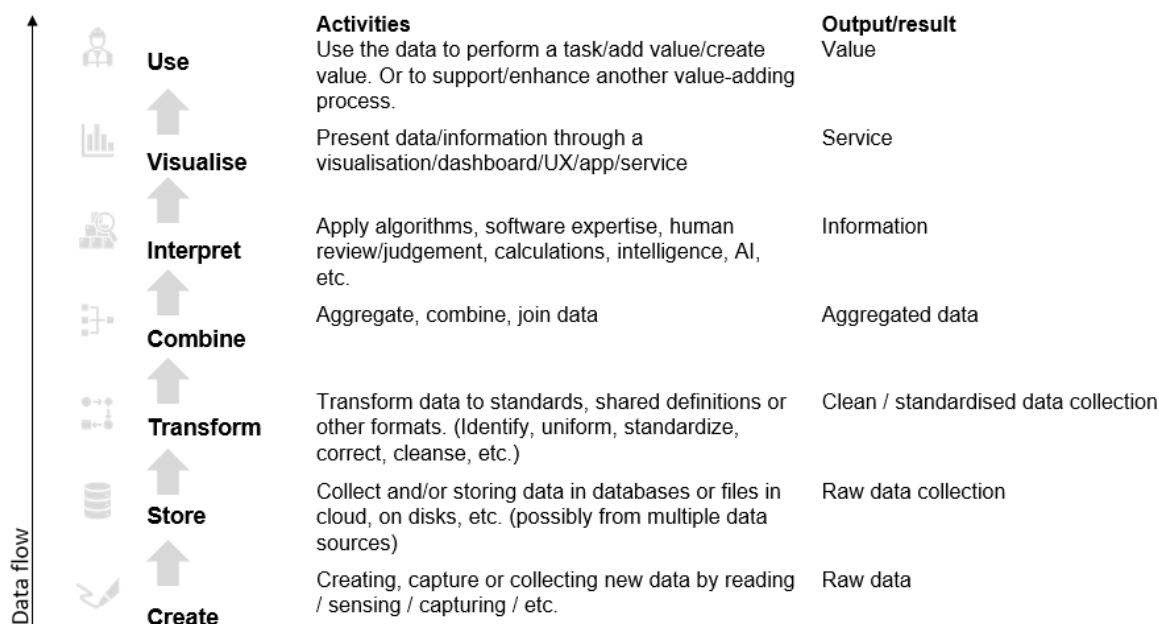


Figure 13: Typical data flows processes

Once the specific data-related activities required in the cooperation have been mapped, partners should decide which of these activities should be conducted jointly or individually. This will allow partners to identify shared processes ranging from exchanging data to shared application (see Figure 14).

Shared data processes must be supported by recommended technical infrastructures and mechanisms to ensure trust including authorisation mechanisms, digital identity standards, verified credentials, standardised API models such as NGSI-LD API, etc. The [catalogue of technical specifications](#) as well as architecture model published by WP3 provide an overview of recommended technologies and standards for DS4SSCC.

Use					
Visualise					
Interpret					
Combine					
Transform					
Store					
Create					
	<b>Exchanging data</b>	<b>Shared Data</b>	<b>Shared Database</b>	<b>Shared Algorithm</b>	<b>Shared Application</b>
<b>What is shared</b>	Data	Data	Aggregated data	Information	Application
<b>Why?</b>	To exchange data on a 'need to know'-basis, without a shared infrastructure, only exchanges (like API's)	Share data from others, that is important for you. To use this data within your own domain and systems.	Collect and aggregate data from multiple sources. To use this aggregated data in your own domain and systems.	To share information/interpretation, without the need to share the source data.	Collect and aggregate data from multiple sources, and create a shared application, to fulfil a shared goal.

Figure 14: Shared processes in cooperation

### 3.2.5. Identify resources required

The template below (Table 20) helps to **identify resources required and associated organisational roles** for the cooperation to be successful. It might be useful to consider the following questions:

- What expertise/ skills/ assets required to meet the cooperation objectives can each partner bring?
- What are the gaps in the resources and capabilities required? Could you leverage partners' wider networks?

Resources include:

- Cash flow/direct funding
- Staff time
- Datasets
- Infrastructure
- Products & services
- Access to expertise
- Access to networks

Resources required for each phase <sup>43</sup> of data cooperation	Examples of associated organisational roles	Preparatory phase	Implementation phase	Operational phase	Scaling up phase
Datasets	Data steward, DPO, Data Scientists				
Data services	CTO, CDO, Data Scientists				
Infrastructures (e.g., hardware, storage, etc.)	CTO, IT Specialists/ technicians, specialist core technology				
Technical support & skills	CTO, technicians, Specialist technical standards				
Legal support & skills	DPO, lawyers				
Strategic staff resources	Partnership Manager, Senior manager				
Operational staff resources	Administrative staff, project manager				
Communication	Communication manager, Marketing manager				
Finances/ funding	Financial manager				

Table 20: Template identifying resources

---

<sup>43</sup> A detailed roadmap to set up a multi-stakeholder data cooperation can be found in D4.2 Roadmap for implementing a European data space for smart and sustainable cities and communities



### 3.2.6. Choose an appropriate model for the cooperation

In the context of DS4SSCC, data cooperation must align with the shared vision and principles set in section 2. The choice of cooperation models depends on the incentives identified for the cooperation as well as the preferred types of exchange(s) between partners. One or more cooperation models can be part of the use-case business model (see Tables 21, 22 & 23, see Table 24 for examples from WP2 use-cases). Table 21 provides an **overview of the characteristics of each of the cooperation models** identified during the preparatory action, focusing on the **type of exchanges** (unilateral, bilateral, and multilateral) and the **approach adopted** (business oriented, altruistic, cooperation, individual control). Table 22 sets out each of the cooperation models and scenarios when to implement them. Finally, Table 23 assesses the advantages and risks of each of these models.

Type	Type exchanges	Type of approach
<b>Commercial Data</b>	Bilateral	Business oriented
<b>Data Marketplace</b>	Multilateral	Business oriented
<b>As-a-service model</b>	Bilateral/multilateral	Business oriented
<b>Open Data / Data Donation</b>	Unilateral	Altruistic
<b>Pragmatic/Ad-hoc Data sharing</b>	Bilateral/multilateral	Cooperation
<b>Trusted Third Party Intermediary</b>	Multilateral	Cooperation
<b>Personal Data Intermediary</b>	Multilateral	Altruistic/ Individual control
<b>Data Common/ Cooperative</b>	Multilateral	Cooperation

Table 21: Overview of data cooperation models

<b>Types</b>	<b>When to use it</b>	<b>How it works</b>	<b>Control on input</b>	<b>Control on use</b>
<b>Commercial data</b>	When data is needed that is not available for free and/or requires a lot of effort to collect, uniform, combine and aggregate.	One or more commercial data providers collect, transform, combine and/or aggregate data and provide the information to users in exchange for a fee (per month, per data set, per GB, etc.).	<b>High.</b> The data provider decides on what data is used for input and how it is processed	<b>Medium.</b> Once delivered to the purchaser, the data can be used for any application. In some cases, the terms and conditions exclude a certain type of use
<b>Data Marketplace</b>	When data is available but is spread all over the internet.	A marketplace provides a platform for data providers to offer their data to potential users. It enables the monetization or brokerage of data for both discovery and transactions between buyers and providers.	<b>Low:</b> if marketplace is open <b>High:</b> if marketplace is curated	<b>Low.</b> Re-use and innovation for unforeseen applications are welcomed
<b>As-A-Service model</b>	When a data owner has an interest in adding an extra service layer on top of the available data	Businesses provide services that are valuable to public bodies and private companies. This includes SaaS (LDT), DaaS (e.g., data quality, aggregation, standardisation, etc) and Algorithm/analytics as a service.	<b>Low.</b> The input of data depends on the information that is provided by data owners and users.	<b>Low.</b> When data analytics and methods of analytics are not provided <b>High.</b> When data analytics and methods of processing are provided
<b>Open Data / Data Donation</b>	When one or more entities (government, non-profit or business) want to provide their data to enable re-use and innovation.	The data is published on a website or portal, or alternatively shared with specific organisations. The data is well-documented with metadata and has a licence that allows for a broad use of the data.  The data can be published using a repository that provides data users an efficient way to search for data as well metadata and a link to the actual data.	<b>High.</b> The initiator decides for itself what data will be published.	<b>Low.</b> Re-use and innovation for unforeseen applications are welcomed
<b>Pragmatic / Ad-hoc data sharing</b>	When participants have a shared interest or objective, and don't mind sharing their (source) data.	In a shared data cooperation, participants define what data they can offer, and what data they would like from other participants. If a satisfying set of data can be agreed upon, this data is shared on a shared disk, cloud platform or any other way to exchange this data.	<b>Medium.</b> All participants agree on what data is input, so there is a strict control. However, only data that participants have and are allowed and willing to share, will be shared.	<b>Medium.</b> Participants agree on what data can be used for what use. However, once the data is out, it is difficult to control the use.
<b>Trusted Third Party Intermediary</b>	When participants don't want to share their (source) data but can think of very specific situations (like incidents/disasters or bankruptcy) where they have a shared interest or objective to share data.	A trusted third party is used to collect, interpret, and combine the data. The third party applies an agreed-upon algorithm or process to provide the required output information. This output information is the minimum amount of (aggregated) data that a) can be shared and b) is needed to fulfil the shared objective	<b>High.</b> All participants agree in advance what data will be provided.	<b>High.</b> Provided information is tailored to and can only be used for specific objectives, as agreed with third party intermediary.



<b>Personal Data Intermediary</b>	When persons should have maximum control over access to their data.	Providing personal data vaults or personal information management systems to citizens, to store their personal data and to empower maximum user control over data access, permissions and data decision making. To facilitate secure, personal control over your data.	<b>High.</b> Each person has maximum control over its personal data vault	<b>High.</b> Each person has maximum control over its personal data vault
<b>Data Common / Cooperative</b>	When members of a community want to protect valuable data, so that it can only be used in a way that contributes to the community.	Data commons refer to organisational arrangements 'with members voluntarily 'pooling' their data for the benefit of a specific community or for the public interest' while data cooperatives refer to 'to a data intermediary owned and democratically controlled by its members who delegate control over data about them' (Janssen & Singh 2022:6)	<b>High.</b> The community has maximum control over data	<b>High.</b> The community has maximum control over data

*Table 22: Detailed overview of cooperation models*



Types	Associated contractual forms	Advantages	Risks
<b>Commercial Data</b>	Data purchasing agreements	Certainty: contractual agreements with specifications Clear legal terms/obligations to stick to by the provider Clear business opportunity for private sector	Risk of discontinuity when contract expires (cannot be renewed) Not always applicable (if you are targeting a specific dataset from one supplier) due to fair competence rules on tenders Can be expensive
<b>Data Marketplace</b>	Data purchasing agreements	Monetarisation Data discoverability Easy process / standardisation of processes	Data is hard to find as it is spread across the internet. Demand and supply of data are inefficiently matched. Can be expensive
<b>As-A—Service model</b>	Service Level Agreements Data Sharing Agreements	Certainty: contractual agreements with specifications Clear legal terms/obligations to stick to by the provider Adapted to specific needs in ecosystem (e.g., SaaS, DaaS (data quality as a service, aggregated data as a service, algorithm/analytics as a service)) Clear business opportunity for private sector	Risk of vendor/ provider lock-in
<b>Open Data / Data Donation</b>	Open data Data altruism	Can foster citizen participation (citizen science, hackathons, etc) Easy process / standardisation of processes	Data can be hard to find as it is spread across different portals/websites. Demand and supply of data are inefficiently matched. Data is not useable and needs a lot of processing (lack of control in specifications)
<b>Pragmatic / Ad-hoc data sharing</b>	Bilateral data sharing agreements Service Level Agreements	Mutual incentives/ win-win situations Possibility of feedback Trustworthy environment	Often bilateral negotiations/agreements which can be time consuming Sustainability over time
<b>Trusted Third Party Intermediary</b>	Cooperation agreements Consortium agreements 'Groupement d'intérêt public' (France) Governance document	Mutual incentives/ win-win situations Possibility of feedback External expert knowledge Trustworthy environment	Difficulty of finding sustainable financing Difficulty of first push
<b>Personal Data Intermediary</b>	Certification of data intermediaries (DGA)	Support individuals in managing their data, including help in managing consent Preference for distributed PDI for data security and privacy	Complexity of use/set-up Data security/ recovery in case of loss/theft Different suppliers (needs for one consent model)



<b>Data Common / Cooperative</b>	Collective ownership & decision making	Mutual incentives exist from the start Possibility of feedback Trustworthy environment Ensure public/community benefit Levelling playing field by enabling collective bargaining power	Difficulty of finding sustainable financing How to encourage bottom-up data stewardship and citizen participation Limited existing use-cases
----------------------------------	--	--	--

*Table 23: Advantages & Risks of different cooperation models*



Name	Business case	Governance structure	Characteristics cooperation	Cooperation models
IDEA	The road authorities invest in IDEA to create high quality data. This data will improve the information to road users (through the service providers) and may be used to efficiently control subcontractors.	IDEA is open to all road authorities in The Netherlands. The resulting data feed is available for free for all service providers. NDW is technical lead, and through its member structure, a steering committee, represented by all key partners, makes decisions about IDEA. A user group is being set up to govern the functional parts.	Multilateral exchanges Cooperation Business-oriented	Trusted-third party (intermediary)
LxDataLab Mobility	LxData Lab is funded internally through the city council. Co-design and collaboration on challenges which allows to develop tools for internal uses (e.g., tool for fire department, prediction model of uses of shared bikes).	Lisbon city council leads and funds the LxData Lab. Each challenge brings the municipality and academic partners together in a cooperation protocol. Each project must identify a specific challenge at city level and must be approved by the municipality's executive board.	Multilateral exchanges Cooperation Altruistic	Pragmatic data sharing As a Service model Open Data
DataCity Lab	Acciona funded the project under the condition that the final product produced should present a new business opportunity both for Acciona and ImpactE.	Barcelona city council led and coordinated the project. DataCity Lab acted as project manager, looked for funding for the challenge, organised workshops to define specific challenges and provided administration and legal support.	Multilateral exchanges Cooperation Altruistic	Pragmatic data sharing As a Service model Open Data/ Data Donation
Rubi Brilla	Internal investment by the council. Rubi Brilla began more than 10 years ago as a strategic project of the council. Technical work financed by EUCF (2022-23) for the development of an innovative Investment Concept based on energy savings. "REFER" model. eDistribucion shares data following an altruistic model	Led and coordinated by the Rubi Brilla unit at council. Citizen participation: give consent to sharing their personal data and give feedback on data driven services.	Multilateral exchanges Cooperation Altruistic	As a Service model Open Data/ Data Donation

Table 24: WP2 Use-cases cooperation models

### 3.2.7. Choose appropriate contractual agreements

The DSSC is currently working on a building block dedicated to contractual agreement. The aim is to provide a catalogue of contractual templates and modules to support data transactions within data spaces, whether they are bilateral or multi-party agreements and thus ensuring consistency across DS. These will include reference licence agreements and contractual modules with standardised clauses.

Here it is important to:

- Ensure technological sovereignty by using specific licensing requirements including **clauses to release products built on data in public domains** or to ensure outcomes of data comes for free to community users that pooled their data with a restricted licence for commercial use.
- Include **data sharing clauses in tender/procurement processes and SLA**. Data sharing clauses can cover data but also aggregation/analytical methods that are deployed so the data is not locked in specific products or platforms and legacy and continuity is ensured over time.
- Customise contracts with **detailed data specifications** (e.g., format, granularity, etc.) (see Appendix 3 for an example of mobile phone data specifications)
- Use open source/ standard protocols
- Use SLA provides a legal set of requirements for the service offering and ensures quality and accountability.
- Consider using initial NDA before final sharing agreement to be able to see if data is useful or not

<b>Example: Data clause for the use of personal data stored in Zaragoza Citizen Card for altruist purposes</b>
<p>'In compliance with the provisions of the current Personal Data Protection Act and Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and on the free movement of such data, you are hereby informed that the data contained in your application for issuance of the Citizen Card will be included in a file for which the City Council of Zaragoza is responsible and whose purpose is the management of the Citizen Card service. The legitimacy is based on the consent of the interested party, who grants authorization to the City Council for the processing of the personal data provided. Personal data will be processed with appropriate security measures, and only for the above-mentioned purpose. It is only contemplated its transfer to third parties for purposes of public interest such as archiving, scientific, historical or statistical research. In any case such transfer will be made after anonymization of such data.'</p>
<p>Source : <a href="https://www.zaragoza.es/sede/servicio/normativa/1502">https://www.zaragoza.es/sede/servicio/normativa/1502</a></p>

*Figure 15: Data sharing clauses – Zaragoza*



### 3.2.8. Sustaining the cooperation over time

To ensure the success of the cooperation and sustain it over time, it is key to plan its scaling up from the start. The aim is for the cooperation to be sustainable i.e. to ensure '*sufficient revenue not only to cover day-to-day operational costs, but also to cover the costs of future investment in the infrastructure and costs to handle iterative change to their business model.*' (ODI, 2020, p.20). Here, partners need to plan for the **incurring costs** (e.g., upfront costs of building infrastructure and setting-up cooperation, operational costs) and the types of **revenue streams** envisioned once the cooperation is operational.

The financing of the cooperation is the most important factor in ensuring its success. Starting a new data cooperation is cost intensive (legal, operational, infrastructure costs, etc), time and resource consuming, and there is a risk it might fail. This is why it is important to plan finances at each phase of the cooperation and anticipate when the main budget will be needed. Ideally, the initial budget should be kept minimal for the success of the pilot. Once the proof of concept is demonstrated, real investments will take place especially in terms of technology and infrastructure as well as scaling up the network. Once the cooperation is operational, the revenues will be diversified and the budget for development minimal.

To keep in mind when planning the budget for the cooperation:

- In the first phases of the project, be aware of the fact that you are developing for a first implementation group, partners can bring **other resources that cash flow**
- Recognise the difference between the **financing** needed to design and set-up a data cooperation and the **ongoing sources of revenue** once it is operational.
- Consider creating a **not-for-profit organisation** that will run the operation of the data cooperation (from Phase 3)
- Consider the use of scaling membership fees, freemium models, and tiered pricing to enable a broader set of users (e.g., reduced fee/free access for non-for-profit, pay fees to access data analytics, membership fee for companies, etc).
- Consider private foundations and investors whose goals and values align with DS4SSCC

ODI (2020) identified a number of appropriate resources of revenues for sustainable data institutions including value-added services, consulting, API, Service Level Agreements, or membership fees (see Table 25)<sup>44</sup>

<sup>44</sup> Adapted from ODI (2020) Designing sustainable data institutions, pp 22-25:  
<https://www.theodi.org/article/designing-sustainable-data-institutions-paper/>



Type	Possible forms
<b>Usage fees</b>	Fees for depositing, submitting or updating data, via a standard API or submission form. Includes registration of organisations, content and identifiers for parts, products and services into an official register/ repository Fees for accessing and using data via a standard API or else.
<b>Subscription fees</b>	Membership fees for access to services, data and other direct benefits provided as part of the cooperation (e.g., training, helpdesk) Subscription fees for use of the infrastructure. Subscription fees for access to a specific product or service that uses the data Subscription fees for access to a higher-level service level agreement or support arrangement for using the infrastructure
<b>Selling of services</b>	Provision of services (including by DS enablers/ intermediaries) It overlaps with the subscriptions and usage fees models
<b>Public funding/ grants</b>	Grants awarded for a specific agreed purpose, for example, to carry out a project or invest in infrastructure (local, regional, national, EU)
<b>Private investment</b>	Money invested by private sector organisations under conditions (return on investment)
<b>Private sponsorship</b>	One-off or regular cash donations and sponsorship
<b>In-kind donations</b>	Provision of staff time to provide support during setup and operations Provision of technical infrastructure to support operations Provision of staff time to develop and maintain software Volunteer time to support collection and curation of data, community engagement, software development, etc Data donations

Table 25: Types of revenue streams



## 4. Recommendations

### 4.1 At the local ecosystem level

#### Local authorities

- Involve relevant stakeholders in local authorities including CDO, CTO, DPO, ICT representative, partnership/strategic representative, legal representative, ethics/equality officer, senior management representative, relevant domain representatives
- Clarify roles and responsibilities within the organisation in terms of data sharing including a referent person for DS4SSCC
- Nominate Executive Champion Advocate in senior management who actively supports initiative
- Create a strategy for partnership development overseen by a strategic partnership manager
- Develop a culture of innovative procurement, including the adoption of common standards in procurement actions
- Develop monitoring and impact assessment tools to better understand and evidence the impacts of data driven local decision and policy making (e.g., Eindhoven's Integrated Impact Assessment Framework)<sup>45</sup>
- Engage in peer learning with other cities and share knowledge/experience
- Consider using 'data sharing obligations' as part of tender/procurement processes and SLA. Local authorities can request service providers to supply data in specific format (e.g., using open data standard) for reuse.
- Explore the domains in a municipality where a data intermediary could fulfil a role (e.g., B2G)
- Build the collective bargaining power of cities: collective negotiation with private sector, in terms of sharing knowledge/experience, data lobbying, data academy
- Big cities should take the lead and set-up networks for data sharing at national level as well as support/upskill smaller cities

#### Private sector

- Identify win-win situations. Example of Waze for Cities/ Google partnership where they get planning data from cities (i.e., data for data).
- Identify national gatekeepers
- Follow recommended standards to foster interoperability.
- Identify gaps of key services in ecosystem
- Create a catalogue of datasets and how they can be used in specific use-cases

#### Academia

- Provide capacity-building and training to city workers and civil society (e.g., data literacy, data science skills)
- Provide courses to professionalise data stewardship (GovLab 2020)
- Conduct applied research on ethical and data protection aspects (open access)
- Help to setup common good principles
- Provide skills (e.g., technical, data) and knowledge (e.g., legal, research)

<sup>45</sup> <https://research.tue.nl/en/publications/guidelines-on-integrated-impact-assessment-framework-for-urban-di>



- Develop tools with robust methodologies
- Provide testing environment (e.g., sandboxes)
- Advise and support cities and communities

### Civil society

- Participate in defining and contributing to the data ownership and governance models of DS4SSCC
- Help safeguarding public interest
- Bring up needs from communities and help frame local challenges

## 4.2 At the national level

- Create a national coordinating body for DS4SSCC with associated community of practice to share knowledge
- Create and fund independent auditing bodies
- Provide incentives/'impulse' to initiatives via calls for projects/funding. Calls can be competitive, which makes them much more difficult to access for smaller or less data mature cities and communities.
- Provide fund to upscale successful local initiatives to national level
- Provide national leadership on data sharing (e.g., data strategy)
- Provide national level guidance / recommended standards and include local authorities in the process of developing/agreeing on standards.
- Identify gaps in the sectoral laws where B2G is considered necessary
- Support the implementation of standard data models and the management migration from legacy systems to compliant innovative solutions that supports interoperability
- Create and sustain national infrastructures and facilities (e.g., National Data Access Points).
- Provide safe testing environments (e.g., sandboxes, see Galasso et al 2022)
- Support culture of innovative procurement
- Play a role in collectivising data-related purchases: intermediation and lowering of costs

## 4.3 At the European level

- Create European coordinating bodies (e.g., NAP Core<sup>46</sup>)
- Provide register of certified Data Altruism Organisations and Data Intermediaries (DGA)
- Share good guidance on how to work with existing EU legislation in relation to DS
- Provide interpretations/examples for Art 15 of DA on exceptional needs
- Clarify the role of data intermediaries in DGA, in particular in relation to municipalities/local authorities as facilitator/gatekeeper of local data sharing
- Involve local authorities as key entities in the European Data Innovation Board<sup>47</sup>

<sup>46</sup> <https://napcore.eu/>

<sup>47</sup> <https://digital-strategy.ec.europa.eu/en/policies/data-governance-act-explained#ecl-inpage-l4ihmjx4>



- Build community of practice with shared and open resources (e.g. repository of software & solutions used, catalogue of good example use-cases, data agreement templates)
- Recognise the key role played by local administration in enabling and fostering a thriving local data ecosystem and how they could play a role of intermediary at local level
- Provide recurring funding for the deployment and sustaining of European data spaces (e.g., infrastructures, coordination efforts)
- Provide safe testing environments (e.g., TEFs)
- Harmonise tech specifications/ data standards for EU procurement including by providing a repository of tenders, standards, changes, procurement clauses to be shared and accessible by cities
- Build a shared platform of principles for better purchasing practices (platform, software) for cities. This can support harmonisation and more sustainable procurement
- Ensure that cities and communities and their specific interests (outside B2B) are represented at all stages of DS4SCC / EU policy design



## 5. Conclusions and next steps

The multi-stakeholder governance scheme layout in this deliverable provides the **foundational principles and governance structure** of the DS4SSCC. It is one component of the blueprint for this data space which also includes a catalogue of specifications (D3.1), an architecture model with a cookbook (D3.2), and a roadmap for the deployment of the data space at the European level (D4.2). Importantly it also provides a practical framework, the **data cooperation canvas**, to set up and sustain multi-stakeholder data collaborations that align with DS4SSCC.

This blueprint will be used, further developed, and validated during the **upcoming DS4SSCC deployment call**. This second phase will start on the 1st of October 2023 and will call upon and support local authorities, communities, and broader stakeholders across Europe to apply to become sites for a pilot.

The DS4SSCC has the ambition not only to become an enabler of the European Green Deal but also to foster trust through multi-stakeholder collaborations and community building. It is embedded in the [Living-in EU](#) movement which brings together public administration representatives at local, regional, national, or European level with representatives of the private sector, non-for profit and academic organisations to boost sustainable digital transformation in cities and communities in the EU. As such, **Living-in.EU**, through its different **working groups** (i.e., legal, technical, financial, capacity building and monitoring), provides a key space to build upon the work of the preparatory action for DS4SSCC.

In the next few months, it will be key to **continue and broaden engagement with stakeholders**, and in particular with **local authorities, communities and citizens**, to ensure the success of the deployment of DS4SSCC. Finally, the coordination and alignment with **other sectoral data spaces** (e.g., Mobility, Tourism, Green Deal, Energy, etc) will also be essential to establish the vision of common European Data Spaces set out in the European Strategy for data.



## 6. References

- Ada Lovelace Institute (2021) *Participatory data stewardship*. Ada Lovelace Institute. Report . <https://www.adalovelaceinstitute.org/report/participatory-data-stewardship/>
- Ada Lovelace Institute (2022), *Rethinking data and rebalancing digital power*. Report. <https://www.adalovelaceinstitute.org/report/rethinking-data/>
- Bahim, C., Casorrán-Amilburu, C., Dekkers, M., Herczog, E., Loozen, N., Repanas, K., Russell, K. & Stall, S. (2020) The FAIR Data Maturity Model: An Approach to Harmonise FAIR Assessments. *Data Science Journal*, 19: 41.
- Barns, S. (2018). Smart cities and urban data platforms: Designing interfaces for smart governance. *City, culture and society*, 12, 5-12.
- Benjamins, R., Vos, J., & Verhulst, S. (2022). Mobile Big Data in the fight against COVID-19. *Data & Policy*, 4, e9.
- Bibri, S. E. (2021). Data-driven smart sustainable urbanism. *GeoJournal*, 86, 43-68.
- Cardullo, P., and R. Kitchin. 92019). Being a 'Citizen' in the Smart City: Up and down the Scaffold of Smart Citizen Participation in Dublin, Ireland. *GeoJournal* 84 (1): 1–13.
- Centre for Data Ethics and Innovation (2021), *Unlocking the Value of Data: Exploring the Role of Data Intermediaries*. CDEI Report. <https://www.gov.uk/government/publications/unlocking-the-value-of-data-exploring-the-role-of-data-intermediaries>
- Chignard, S., & Glatron, M. (2023). Data collaborations at a local scale: Lessons learnt in Rennes (2010–2021). *Data & Policy*, 5, E20.
- Correia, D., Marques, J. L., & Teixeira, L. (2022). The state-of-the-art of smart cities in the European Union. *Smart Cities*, 5(4), 1776-1810.
- Espinoza, M. I., & Aronczyk, M. (2021). Big data for climate action or climate action for big data? *Big Data & Society*, 8(1).
- Farrell, E., Minghini, M., Kotsev, A., Soler Garrido, J., Tapsall, B., Micheli, M., Posada Sanchez, M., Signorelli, S., Tartaro, A., Bernal Cereceda, J., Vespe, M., Di Leo, M., Carballa Smichowski, B., Smith, R., Schade, S., Pogorzelska, K., Gabrielli, L. & De Marchi, D., (2023) *European Data Spaces - Scientific Insights into Data Sharing and Utilisation at Scale*, Publications Office of the European Union, Luxembourg. ISBN 978-92-68-03166-7, doi:10.2760/301609, JRC129900.
- Fritzenkötter, J., Hohoff, L., Pierri, P., Verhulst, S., Young, A., & Zacharzewski, A. (2022). *Governing the Environment-Related Data Space*. Available at: <https://files.thegovlab.org/erdgovernance.pdf>
- Galasso, G., Montino, C., Gori, M., Rasmussen, M., Roman, L., Mccolgan, O., Liva, G., Rebesco, E., Brynskov, M., Mulquin, M., Micheli, M., Schade, S., Smith, R. and Kotsev, A., (2022) *Sandboxing. How to use it to strengthen your local data ecosystem*. Publications Office of the European Union, Luxembourg. ISBN 978-92-76-58779-8, doi:10.2760/779684, JRC130555
- GovLab (2020) Wanted: Data Stewards, (re)Defining the Roles and Responsibilities of Data Stewards for an Age of Data Collaboration. *GovLab Report*.
- Granell, C., Mooney, P., Jirka, S., Rieke, M., Ostermann, F., Van Den Broecke, J., Sarretta, A., Verhulst, S., Dencik, L., Oost, H., Micheli, M., Minghini, M., Kotsev, A.& Schade, S., (2022) *Emerging approaches for data-driven innovation in Europe*, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-46936-0, doi:10.2760/511775, JRC127730.
- Gupta, A., Panagiotopoulos, P., & Bowen, F. (2020). An orchestration approach to smart city data ecosystems. *Technological Forecasting and Social Change*, 153, 119929.
- Helderop, E. Grubesic, T & Alizadeh, T (2019). Data deluge or data trickle? *Information Society*, 35(2): 69–80.
- Janssen, H., & Singh, J. (2022). The Data Intermediary. *Internet Policy Review* 11(1).



- Liva, G., Micheli, M., Schade, S., Kotsev, A., Gori, M., & Codagnone, C. (2023). City data ecosystems between theory and practice. *Data & Policy*, 5, E17.
- IDSA (2021) *New Business Models for Data Spaces Grounded in Data Sovereignty*, Position Paper Sneak preview version, April: <https://internationaldataspaces.org/wp-content/uploads/IDSA-Position-Paper-New-Business-Models-sneak-preview-version.pdf>
- Klievink, B., Van Der Voort, H., & Veeneman, W. (2018). Creating value through data collaboratives. *Information Polity*, 23(4), 379-397.
- Maffei, S, Leoni, F. & B. Villari (2020) Data-driven anticipatory governance. Emerging scenarios in data for policy practices, *Policy Design and Practice*, 3:2, 123-134
- Martin, S., Gautier, P., Turki, S. and Kotsev, A., *Establishment of Sustainable Data Ecosystems: Recommendations for the evolution of spatial data infrastructures*, EUR 30626 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-31385-4
- Mauree, D., Naboni, E., Coccolo, S., Perera, A. T. D., Nik, V. M., & Scartezzini, J. L. (2019). A review of assessment methods for the urban environment and its energy sustainability to guarantee climate adaptation of future cities. *Renewable and Sustainable Energy Reviews*, 112, 733-746.
- Meijer, A (2018) Datapolis: A public governance perspective on smart cities. *Perspectives on Public Management and Governance* 1, 195–206.
- Mercille, J. (2021). Inclusive smart cities: beyond voluntary corporate data sharing. *Sustainability*, 13(15), 8135.
- Micheli, M (2022) Public bodies' access to private sector data. *First Monday* 27(2).
- Micheli, M., Farrell, E., Carballa-Smichowski, B., Posada-Sánchez, M., Signorelli, S., Vespe, M., (2023) *Mapping the landscape of data intermediaries — Emerging models for more inclusive data governance*, Publications Office of the European Union, Luxembourg, doi:10.2760/261724, JRC133988.
- Micheli, M, Ponti, M, Craglia, M and Berti Suman, A (2020) Emerging models of data governance in the age of datafication. *Big Data & Society* 7(2), 1–15.
- ODI, (2022) *Bottom-up data institutions: mechanisms for government support*. Open Data Institute. Report. March [https://theodi.org/wp-content/uploads/2022/03/ODI-2022-Bottom-up-data-institutions\\_Mechanisms-for-government-support.pdf](https://theodi.org/wp-content/uploads/2022/03/ODI-2022-Bottom-up-data-institutions_Mechanisms-for-government-support.pdf)
- ODI (2021) *Accelerating progress on tackling the climate crisis through data collaborations*. Open Data Institute Report. February [https://theodi.org/wp-content/uploads/2021/02/2021-02\\_ODI\\_Accelerating-progress-on-tackling-the-climate-crisis-through-data-collaboration.pdf](https://theodi.org/wp-content/uploads/2021/02/2021-02_ODI_Accelerating-progress-on-tackling-the-climate-crisis-through-data-collaboration.pdf)
- OECD (2021), *Innovation and Data Use in Cities: A Road to Increased Well-being* , OECD Publishing, Paris, <https://doi.org/10.1787/9f53286f-en>.
- OECD. (2019). *Enhancing Access to and Sharing of Data Reconciling Risks and Benefits for Data Re-use Across Societies*. OECD Publishing.
- Pereira, G. V., Macadar, M. A., Luciano, E. M., & Testa, M. G. (2017). Delivering public value through open government data initiatives in a Smart City context. *Information Systems Frontiers*, 19, 213-229.
- Pittaway, JJ & Montazemi, AR (2020) Know-how to lead digital transformation: The case of local governments. *Government Information Quarterly* 37(4), 101474
- Przebylarcz, E, Maria Alexandra Cunha, Stan Geertman, Charles Leleux, Ank Michels, Zsuzsanna Tomor, C. William R. Webster & Albert Meijer (2022) Citizen participation in the smart city. *Local Government Studies*, 48:1, 23-47.
- Ruijer E & Meijer, A (2020) Open Government Data as an Innovation Process. *Public Performance & Management Review*, 43:3, 613-635



- Susha, I., Rukanova, B., Zuiderwijk, A., Gil-Garcia, J. R., & Hernandez, M. G. (2023). Achieving voluntary data sharing in cross sector partnerships: Three partnership models. *Information and Organization*, 33(1), 100448.
- Susha, I., van den Broek, T., van Veenstra, A. F., & Linåker, J. (2023b). An ecosystem perspective on developing data collaboratives for addressing societal issues: The role of conveners. *Government Information Quarterly*, 40(1), 101763.
- Susha, I., Schiele, J., Frenken, K. (2022). Business-to-Government Data Sharing for Public Interests in the European Union In: Janssen, M., et al. *Electronic Government. EGOV 2022. Lecture Notes in Computer Science*, vol 13391. Springer, Cham.
- Tangi, L, Janssen, M, Benedetti, M and Noci, G (2020) Barriers and drivers of digital transformation in public organisations. In Viale Pereira, G., Janssen, M., Lee, H., Lindgren, I., Rodriguez Bolivar, M.P., Jochen Scholl, H., and Zuiderwijk, A. (eds), *Electronic Government. EGOV 2020*, Vol. 12219. Cham: Springer.
- van Ooijen, C., B. Ubaldi, and B. Welby (2019), A data-driven public sector. *OECD Working Papers on Public Governance*, No. 33, OECD Publishing, Paris.
- Verhulst, S (2021) Reimagining data responsibility: 10 new approaches toward a culture of trust in re-using data to address critical public needs. *Data & Policy* 3, E6.
- Verhulst, S., Young, A., Winowatan, M. & Zahuranec, A. (2019) *Leveraging Private Data for Public Good*, GovLab report. <https://thelivinglib.org/leveraging-private-data-for-public-good-a-descriptive-analysis-and-typology-of-existing-practices/>
- WEF (2022) *Unlocking the Shared Value of Smart City Data, A Protocol for Action*, White Paper, June:  
[https://www3.weforum.org/docs/WEF\\_Unlocking\\_Shared\\_Value\\_Smart\\_City\\_Data\\_2\\_022.pdf](https://www3.weforum.org/docs/WEF_Unlocking_Shared_Value_Smart_City_Data_2_022.pdf)
- WEF (2021) *Towards a Data Economy*. White Paper. August:  
[https://www3.weforum.org/docs/WEF\\_Towards\\_a\\_Data\\_Economy\\_2021.pdf](https://www3.weforum.org/docs/WEF_Towards_a_Data_Economy_2021.pdf)
- Williams, S. (2020) *Data Action: Using Data for Public Good*. MA. MIT Press. ISBN: 9780262044196
- Wilkinson, M., Dumontier, M., Aalbersberg, I., Appleton, G., Axton, M., Baak, A., & Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*, 3(1), 1–9.



## About Data Space for Smart and Sustainable Cities and Communities (DS4SSCC)

Data is a central aspect of the twin green and digital transformation, and European cities, regions, towns, and rural areas play a vital role in safely leveraging its potential. This preparatory action for a Data Space for Sustainable and Smart Cities and Communities (DS4SSCC) provides a coordinated starting point for public, private, and individual stakeholders to contribute and use data, aligned with European values and policies. This preparatory action emphasises the sustainability aspect – green, social, and economic – and the diversity of communities, and aims to:

- Develop a multi-stakeholder data governance scheme by bringing together European cities and their local stakeholders ('quadruple helix') to collaborate on use cases relevant to Green Deal objectives through an operational local data governance core group".
- Create a blueprint for the European DS4SSCC by co-creating with stakeholders a methodology for setting it up, from the vision of a full-fledged pan-EU DS4SSCC, not only from a technical perspective but also giving operational guidance e.g., for procurement.
- Bring an agreed set of priority datasets into conformity with the new blueprint by delivering a catalogue of domains, use cases and related data sets for DS4SSCC.
- Develop a roadmap and action plan towards a mature, connected pan-EU DS4SSCC.
- Shape and implement the data space on the local, regional, national and EU levels, taking into account their different levels of maturity, will be an exercise in co-creation with the stakeholder forum.

Documentation will include recommended actions for standardisation, business models and strategies for running data spaces, and a vision for the federation of platforms. Building on core European networks of cities and communities that have championed the Living-in.EU movement, DS4SSCC is a timely, ambitious, and essential contribution towards the sustainability goals of European citizens.

### Our consortium:

 OPEN & AGILE SMART CITIES		 European Network of Living Labs
	 AUSTRIAN INSTITUTE OF TECHNOLOGY	 Gospodarska zbornica Slovenije Chamber of Commerce and Industry of Slovenia