



Brussels, 18.11.2022  
SWD(2022) 710 final

**COMMISSION STAFF WORKING DOCUMENT**

**European Interoperability Framework for Smart Cities and Communities (EIF4SCC)**

*Accompanying the document*

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL  
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**on a strengthened public sector interoperability policy**

**Linking public services, supporting public policies and building public benefits  
Towards an 'Interoperable Europe'**

{COM(2022) 710 final}

## **Table of Contents**

1. OVERVIEW AND SCOPE .....	3
2. INTRODUCTION TO EIF4SCC .....	5
3. DEFINITIONS OF THE EIF4SCC CONCEPTS .....	8
4. PRINCIPLES FOR THE EIF4SCC .....	9
5. ELEMENTS FOR THE EIF4SCC .....	13
6. TAILORED CONCEPTUAL MODEL FOR INTEGRATED SCC SERVICES .....	18
7. CONCLUSION .....	23

## Glossary

<b>Acronym</b>	<b>Meaning</b>
AI	Artificial Intelligence
API	Application Programming Interface
CEF	Connecting Europe Facility
EIF	European Interoperability Framework
EIF4SCC	European Interoperability Framework for Smart Cities/Communities
ESPON	European Observation Network for Territorial Development and Cohesion
EU	European Union
EC	European Commission
ICC	Intelligent Cities Challenge
ICT	Information and Communication Technologies
IoT	Internet of Things
ISA <sup>2</sup>	Interoperability solutions for public administrations, businesses and citizens
LORDI	Local and Regional Digital Indicators
MIMs Plus	Minimal Interoperability Mechanisms
NIO	National Interoperability Framework
SCC	Smart and Sustainable Cities and Communities

## 1. 1. OVERVIEW AND SCOPE

As stipulated in the Treaties of the European Union (EU), the EU's internal market guarantees four 'freedoms' - the free movement of goods, capital, services and people between the 27 Member States. These freedoms are assured by common policies supported by interconnected, interoperable networks and systems. People are free to work and relocate and businesses are free to trade and operate in all EU Member States. In doing so, they inevitably have to interact electronically with all levels of Member State public administrations being national, regional or local. Public administrations at regional and local level including rural and urban areas can be named under the wording 'Cities and Communities'.

Cities and communities are confronted with complex challenges, such as climate change, housing quality, health and social issues, energy efficiency and urban mobility. More and more cities and communities are making use of the possibilities offered by digital solutions and technological advancements to tackle those growing challenges and to contribute to the green transition. Cities and communities are therefore transforming themselves into Smart and Sustainable Cities and Communities (SCC) taking full benefit of digital technologies and becoming more green, resilient and sustainable for the well-being of people.

Interoperability is crucial to overcome the above-mentioned challenges in cities and communities. Lack of interoperability leads to fragmented service delivery at local level as well as a lack of communication among different platforms, technologies and stakeholders, resulting in suboptimal services to the public.

**Acknowledging the importance of interoperability for the well-being of inhabitants, businesses, visitors and city/community administrators in the European Union, the European Commission developed a European Interoperability Framework for Smart Cities and Communities (EIF4SCC) as a specialisation of the European Interoperability Framework<sup>1</sup>.**

The EIF4SCC has been developed by building on and finding complementarities with previous and ongoing initiatives, such as, for instance the Living-in.EU<sup>2</sup> movement, the 2017 European Interoperability Framework (EIF)<sup>3</sup>, the Minimal Interoperability Mechanisms (MIMs Plus)<sup>4</sup> and the outcomes of EU funded initiatives (e.g. Connecting Europe Facility (CEF) Digital Building Blocks<sup>5</sup>, Smart Cities Marketplace<sup>6</sup>, Intelligent Cities Challenge<sup>7</sup>, Digital Transition Partnership under the Urban Agenda<sup>8</sup>) and EU funded projects (Synchronicity<sup>9</sup>, Triangulum<sup>10</sup>, etc.) as illustrated in Figure 1.

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1 [https://ec.europa.eu/isa2/eif\\_en/](https://ec.europa.eu/isa2/eif_en/)

2 <https://www.living-in.eu/>

3 [https://ec.europa.eu/isa2/eif\\_en](https://ec.europa.eu/isa2/eif_en)

4 <https://oascities.org/minimal-interoperability-mechanisms/>

5 <https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/CEF+Digital+Home>

6 <https://smart-cities-marketplace.ec.europa.eu/>

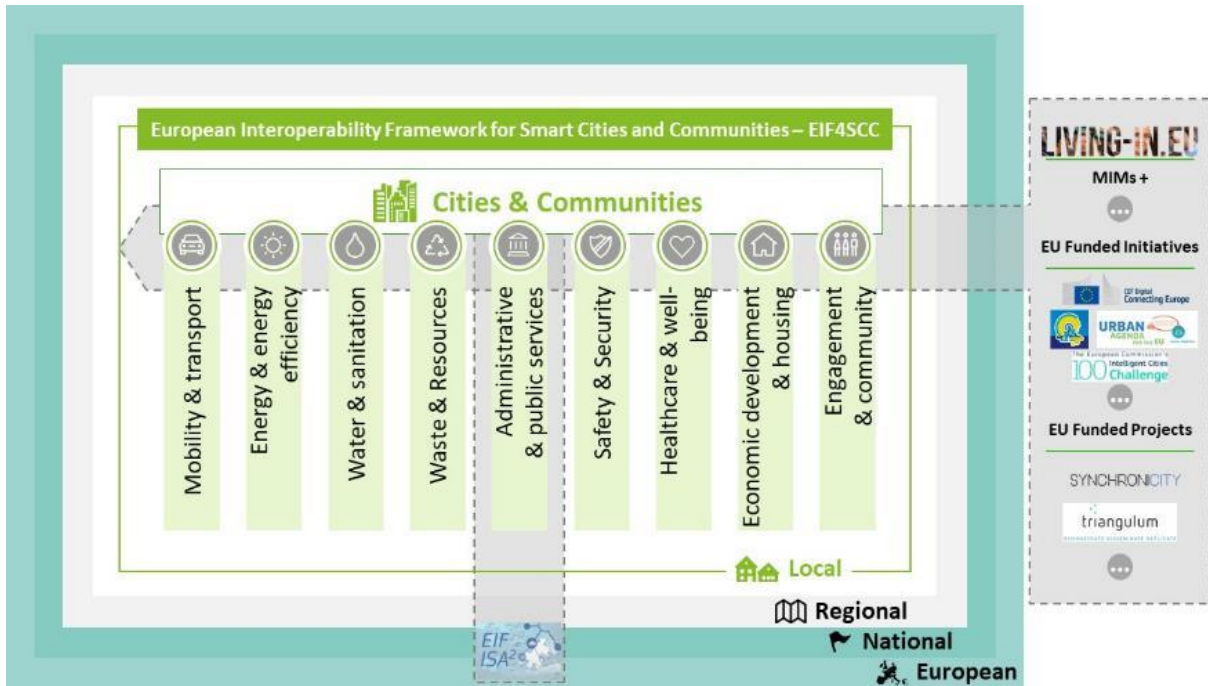
7 <https://www.intelligentcitieschallenge.eu/>

8 <https://ec.europa.eu/futurium/en/digital-transition/digital-transition-action-plan>

9 <https://synchronicity-iot.eu/>

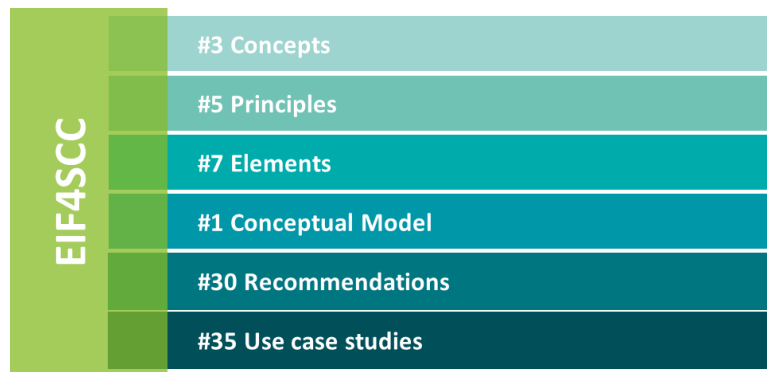
10 <http://triangulum-project.eu/>

Figure 1 – EIF4SCC alignment with other EU initiatives & projects



The aim of the EIF4SCC is to **provide European Union local administration leaders with concepts, principles, elements, recommendations and a common model to facilitate service delivery to the public across domains, cities, regions and borders (Figure 2). Practical use cases available in the proposal for an EIF4SCC, have been provided for each recommendation in the course of the EIF4SCC development<sup>11</sup>.**

Figure 2 - EIF4SCC in a nutshell



<sup>11</sup> See Proposal for an EIF4SCC: <https://living-in.eu/news/proposal-european-interoperability-framework-smart-cities-and-communities-eif4scc-published>

## 2. 2. INTRODUCTION TO EIF4SCC

Cities and communities have a fundamental role in the European Union. They are the place where most European citizens live and work<sup>12</sup>. Cities and communities include inhabitants, visitors, administrators, businesses and organisations. Furthermore, they are places where digital solutions and technology can support the creation of value that unlocks social, economic and environmental benefits for their citizens and businesses. Cities and communities are confronted with complex challenges, and therefore are using digital solutions and technological advancements to tackle these growing and often interlinked challenges. Co-creation with citizens is also key to turning European cities and communities into smart, resilient, sustainable and inclusive places where people enjoy living, working and visiting.

Current complex challenges and their solutions raise the need for improved interoperability. Lack of interoperability leads to a missing integration of services provided at local level and beyond or a lack of communication among different (data) platforms and/or technologies. The lack of interoperability is also a major obstacle to foster the progress of innovation in cities and communities. It can delay the contribution to meet the targets stated under the Europe's digital decade and the EU Green Deal.

Progressing interoperability will help to fully address the challenges faced by cities and communities via digital solutions and technological advancements, the different actors need a common understanding of their way of working, their activities and services. This includes reflecting on the applicable legal frameworks but also on the standards and technical specifications that are applied in the technical development of services, just to mention an example. In addition, interoperability avoids vendor or technology lock in and helps create an open and fair market where SMEs can develop. Cities and Communities benefit from a variety of standard-based solutions that are interoperable and more affordable, reducing time to implement and to deliver services to the public.

The purpose of the EIF4SCC is to:

- **inspire cities and communities** across the EU in their efforts to transition to SCC, in particular in the delivery of digital services within their local context, together with the other actors;
- **provide guidance to EU local administration leaders** with principles, recommendations and a common model that enables interoperability across domains, cities and communities, regions and borders, to improve service delivery for citizens and businesses;
- **contribute to shaping Europe's digital future** by fostering cross-border and cross-sectoral interoperability, supporting as such Europe's digital transformation in the local context.

The EIF4SCC deliberately focuses on EU local administration leaders as it aims to provide a generic framework of what interoperability entails, and how it can contribute to the development of a smart(er) city or community. This will pave the way for services for citizens and business to be offered not only in a single SCC, but also across cities, regions and across borders.

The EIF4SCC includes three interconnected definitions, five principles, and seven elements. To ensure that EU local administration leaders can easily apply the EIF4SCC to their city or community, a conceptual model for integrated service governance was developed. This conceptual model presents the governance support required for the coordination of activities. The EIF4SCC is punctuated with recommendations that can inspire EU local administration

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<sup>12</sup> Eurostat, 2016, Urban Europe Statistics on cities, towns and suburbs.

leaders in their work on interoperability. All these EIF4SCC parts are explained in detail in the following sections.

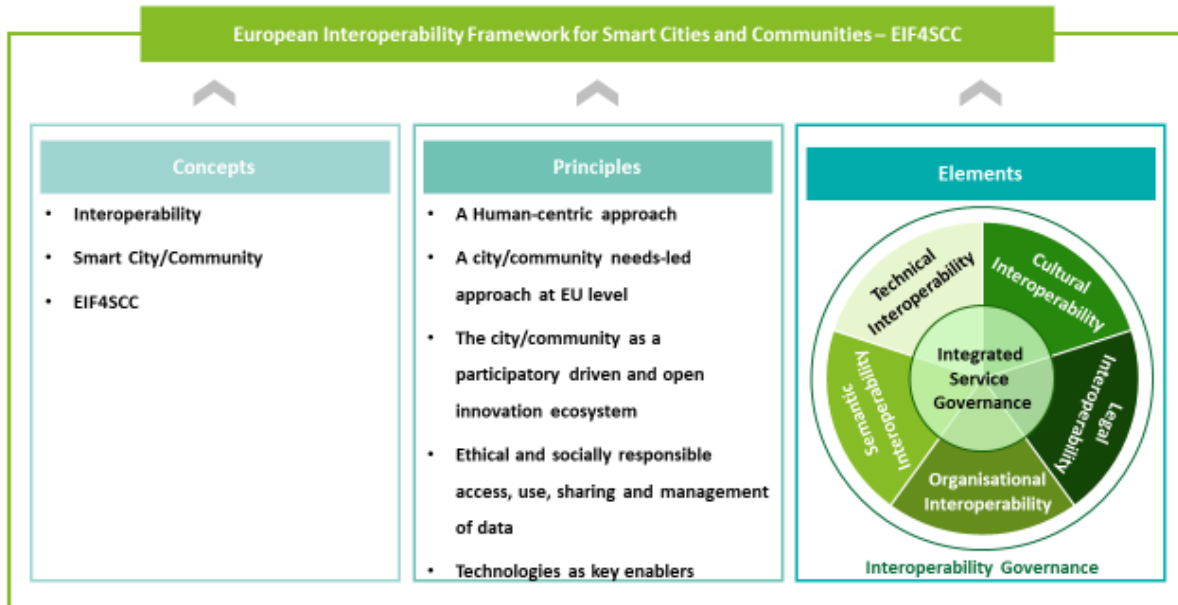
Whereas Figure 3 presents an overview of the EIF4SCC and its elements, the content and structure of the EIF4SCC is presented below:

- Chapter 3 presents the definitions of the concepts set out in the EIF4SCC;
- Chapter 4 presents a set of principles (five) intended to establish a general approach when developing SCC services based on interoperability;
- Chapter 5 presents the elements (seven) of the EIF4SCC;
- Chapter 6 outlines a conceptual model for Integrated SCC Services. The conceptual model is in line with the interoperability principles and proposes the idea of 'interoperability by design';
- Chapter 7 concludes the document by providing an overview and tying together the major elements of the EIF4SCC;
- In addition, a set of 30 recommendations are presented across the different chapters and are illustrated by numerous use cases available in the proposal for an EIF4SCC<sup>13</sup>, as actionable items to be implemented in SCC.

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<sup>13</sup> <https://living-in.eu/news/proposal-european-interoperability-framework-smart-cities-and-communities-eif4scc-published>

Figure 3 - EIF4SCC Framework for SCC





### 3.3. DEFINITIONS OF THE EIF4SCC CONCEPTS

This section presents how the concepts of Interoperability, Smart Cities and Communities and the EIF4SCC should be understood (Figure 4). A definition is provided for each concept. When referring to the EIF4SCC, these three definitions always need to be presented together, as they relate to and reinforce each other. One cannot fully benefit from the EIF4SCC, when the concepts of Interoperability and SCC are not well acknowledged.

Figure 4 - EIF4SCC Concepts



Interoperability in the context of SCC, and as such in and between the different domains of a city or community, is:

***The ability of organisations and individuals to interact towards the delivery of services in cities and communities, through the exchange of data, information and knowledge, enabled by aligned processes and digital technologies, taking into account security and privacy issues.***

A Smart City/Community<sup>14</sup> is:

***A sustainable and inclusive city/community aiming at the well-being of their inhabitants, businesses, visitors, organisations and city/community administrators by offering digitally-enabled services.***

EIF4SCC is:

***An approach to support the development of interoperable services in a smart city/community across domains and across cities and borders. It defines basic interoperability guidelines in the form of common principles, elements, models and recommendations.***

<sup>14</sup> This framework refers consequently to Cities and Communities, as the document targets local administration leaders from EU capital cities up to the local villages and urban areas around the EU. Cities and communities mean geographically defined communities of people, having legal status, legal representative and self-governance, legally recognised by its Member State.

#### 4.4. PRINCIPLES FOR THE EIF4SCC

Besides the three concepts defined above, the EIF4SCC is also underpinned by five principles (Figure 5). They are the result of tailoring the Living-in.eu movement and the 2017 European Interoperability Framework principles to the context of SCC. Hence, they form the fundamental behavioural aspects defining the direction of the interoperability in SCC.

These five principles are presented below, together with a set of respective recommendations on how to apply them in the SCC context. \_

*Figure 5 - EIF4SCC Principles*

<b>#5 Principles</b>	<b>A human-centric approach</b> #3 recommendations
	<b>A city/community needs-led approach at EU level</b> #1 recommendation
	<b>The city/community as a participatory-driven and open innovation ecosystem</b> #2 recommendations
	<b>Ethical and socially responsible access, use, sharing and management of data and technology</b> #3 recommendations
	<b>Technologies as key enablers, not as the objective</b> #3 recommendations

- **A human-centric approach**, whereby well-being, inclusivity, accessibility and multiculturalism/multilingualism play a key role. From the service delivery perspective, this approach should also include administrative simplification for the benefit of individuals and organisations. Therefore, this embraces the once only principle<sup>15</sup>, aiming to reuse data and documents that people have already provided, in a transparent and secure way.

### Recommendation #1

Ensure that inhabitants and visitors play an active role by connecting, engaging and enabling them in policy-making, co-creation and testing of solutions for SCC.

### Recommendation #2

As far as possible under the legislation in force, ask the users of cities/communities services once-only and relevant-only information, ensuring a fully transparent process on how data is used.

### Recommendation #3

Ensure that accessibility (including for people with disabilities, the elderly and other disadvantaged groups) is taken into consideration during the procurement, design, development, implementation and monitoring phase of service provision, including by following e-accessibility specifications at regional, national, European or international level.

- **A city/community needs-led approach at EU level**, sharing experiences relating to interoperability is a key strategy to overcome interoperability challenges and to inspire individuals or organisations within and across cities/communities. Therefore, identifying commonalities across different city/community contexts can help provide efficient and tailored support.

### Recommendation #4

Endorse and join existing forums, networks and working groups, at local, regional, national and European level<sup>16</sup> to boost cooperation, collaboration, join forces, discuss and share experiences and best practices and build upon the knowledge and experience already available.

<sup>15</sup> The once only principle means that individual users/businesses should not be required to supply the same information more than once. For instance, if information has already been submitted to one public administration, individual users/businesses should not be required to submit that information again to another public administration.

- EU eGovernment Action Plan 2016-2020, COM(2016) 179 <https://digital-strategy.ec.europa.eu/en/policies/egovernment-action-plan#:~:text=The%20eGovernment%20Action%20Plan%20enables,to%20operate%20efficiently%20across%20borders>
- Berlin Declaration on Digital Society and Value-Based Digital Government, 2020 [https://ec.europa.eu/isa2/sites/default/files/cdr\\_20201207\\_eu2020\\_berlin\\_declaration\\_on\\_digital\\_society\\_and\\_value-based\\_digital\\_government\\_.pdf](https://ec.europa.eu/isa2/sites/default/files/cdr_20201207_eu2020_berlin_declaration_on_digital_society_and_value-based_digital_government_.pdf)

<sup>16</sup> Examples of existing forums, networks and working groups include: Living-in.EU, Intelligent Cities Challenge, Open and Agile Smart Cities, EUROCITIES, The European Network of Living Labs (ENoLL), Smart Cities Marketplace, European Regions Research and Innovation Network (ERRIN), Local Governments for Sustainability (ICLEI), etc.

- **The city/community as a participatory-driven and open innovation ecosystem** should promote an open and collaborative approach that takes into consideration the opinion of individuals and organisations, and thereby builds on participatory approaches, such as co-creation and co-production.

#### Recommendation #5

Ensure collaboration and communication between inhabitants, business, visitors, organisations and city/community administrators, in your city/community, so that different needs (e.g. assisted living, social care, health, education, culture and environment), challenges and requirements are addressed in a collaborative way by involving stakeholders with all the necessary competencies and/or skills in the co-creation and co-production of services.

#### Recommendation #6

Foster an open innovation ecosystem (such as local living labs, digital innovation hubs) to ensure that the local community is actively involved in creating new and scaling up solutions.

- **Ethical and socially responsible access, use, sharing and management of data and technology**, that considers transparency, security and privacy. The protection of the individuals' privacy, the preservation of their information and its security must be guaranteed as well as the right of the individual to be forgotten.

#### Recommendation #7

Make sources of information (base registries, open data portals, etc.) available to inhabitants, business, visitors, organisations and city/community administrators ensuring security, trust and privacy in accordance with the relevant legislation and contribute to the EU data space for climate neutral and smart communities.

#### Recommendation #8

Ensure that digital rights are respected during the design, development, implementation and monitoring phase of the services provision (including GDPR issues).

#### Recommendation #9

Ensure transparency on data sharing collaborations between and within government, citizens, businesses and organisations.

- **Technologies as key enablers, not as the objective.** Technology should only be considered as an enabler when appropriate. Technological neutrality and data portability should be taken into account when developing services. Open standards and open technical specifications should be employed in the development of interoperable digital platforms. This will require an appropriate assessment of technologies effectiveness and efficiency. Hence, the use of technologies must consider the development of digital skills and capacities of the service providers and the users.

Open standards and open technical specifications avoid vendor or technology lock in and enable interoperability while fostering the smart city ecosystem and the related digital solutions market. The level of openness of a specification/standard is decisive for the reuse of software components implementing that specification. This also applies when

such components are used to introduce new services. If the openness principle is applied in full:

- All stakeholders have the opportunity to contribute to the development of the specification and a public review is part of the decision-making process;
- The specification is available for everyone;
- Intellectual Property Rights to the specification are licensed on Fair, Reasonable and Non-Discriminatory (FRAND) terms, in a way that allows implementation in both proprietary and open source software, and preferably on a royalty-free basis.

#### **Recommendation #10**

Use open standards and open technical specifications when developing local data platform/space and services, include multiple access and assistance channels to ensure that users can choose the option that best addresses their needs and/or preferences.

#### **Recommendation #11**

Implement seamless solutions at the service of inhabitants, businesses, visitors, organisations and city/community administrators, leveraging advanced technologies (such as IoT, blockchain, AI, etc.).

#### **Recommendation #12**

Set-up or consolidate interoperable local data platform(s)/space(s) that integrate and reuse data in cities and communities by stakeholders, and promotes open standards and open technical specifications, APIs<sup>17</sup> and data models to provide a holistic view of the information. This aims to support in decision-making process and to foster innovation and citizen engagement.

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<sup>17</sup> Directive 91/250 (or 2009/24/EC)

**5. 5. ELEMENTS FOR THE EIF4SCC**

Building on the key concepts and principles, Figure 6 presents the elements of the EIF4SCC

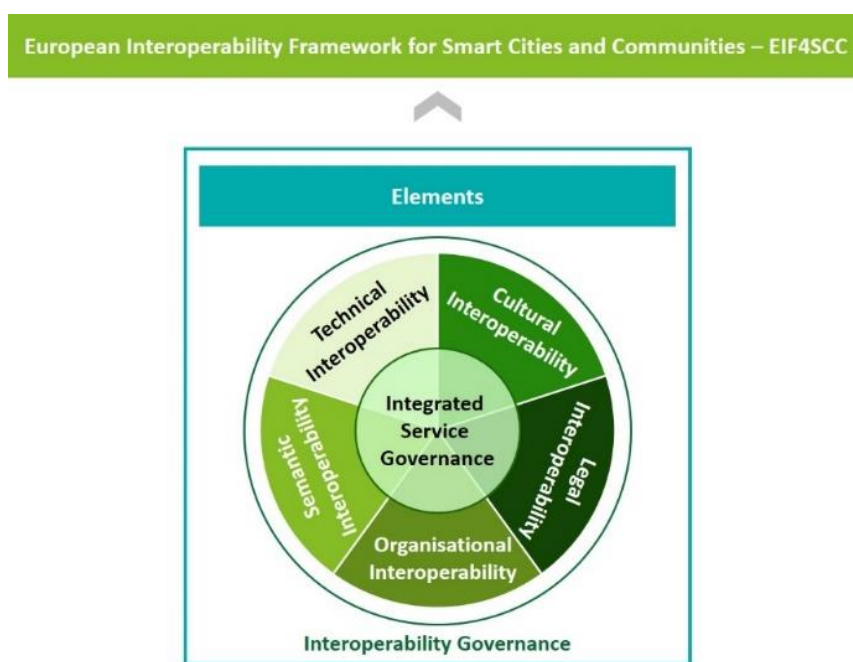
*Figure 6 - EIF4SCC Elements*

<b>#7 Elements</b>	<b>Interoperability Governance</b> #1 recommendation
	<b>Integrated Service Governance</b> #4 recommendations
	<b>Cultural interoperability</b> #2 recommendations
	<b>Legal interoperability</b> #2 recommendations
	<b>Organisational interoperability</b> #1 recommendation
	<b>Semantic interoperability</b> #1 recommendation
	<b>Technical interoperability</b> #6 recommendations

EIF4SCC is built on five interoperability components, one cross-cutting layer, all built on the foundation of Interoperability Governance (Figure 7). The following interoperability components have been identified:

- 1) Cultural interoperability,
- 2) Legal interoperability,
- 3) Organisational interoperability,
- 4) Semantic interoperability and,
- 5) Technical interoperability.

Figure 7 - The elements of the EIF4SCC interoperability model



As such this EIF4SCC interoperability model retains some characteristics of the 2017 European Interoperability Framework. This ensures a common European approach to interoperability. In addition to the revised layered design, the main changes in the EIF4SCC are the addition of Cultural Interoperability and the modification of Integrated Public Service Governance, which is re-labelled as Integrated Service Governance.

- **Interoperability governance** is key to a **holistic approach** to interoperability, referring to decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability at local, national and EU levels.

### Recommendation #13

Define and implement a holistic governance of interoperability services across domains and stakeholders at the local level, complying with national and European interoperability requirements to ensure interoperability across cities/communities, regions and borders.

- **Integrated service governance.** The 2017 EIF refers to the public nature of services and states that European public service provision often requires different public administrations to work together to meet end-users' needs and provide **public services in an integrated way**. In the EIF4SCC the concept *public* is removed. The cross-cutting layer becomes broader, acknowledging the role of non-public administration actors in the service provision in the context of SCC. As a substantial amount of data and information in a SCC context is out of the hands of public administrations, the Integrated service governance has to take a broader view and not look beyond the public administration itself. Therefore, Integrated service governance refers to the governance context and encompasses all components: cultural, legal, organisational, semantic and technical interoperability. Ensuring interoperability when agreeing the cultural context, preparing legal instruments, organising collaboration processes, data and information exchange, services and components that support SCC services is a continuous task, as

interoperability is regularly disrupted by changes to the environment. Integrated service governance results in an integrated service pathway and shared workflows.

#### Recommendation #14

Reuse and share solutions, data, tools and services by cooperating with different stakeholders in the design, development, implementation and monitoring phase of service provision at local, regional, national and European levels.

#### Recommendation #15

Establish and maintain an integrated governance structure with relevant stakeholders to ensure interoperability in the delivery of the integrated services, in coordination with the holistic interoperability governance guidance.

#### Recommendation #16

Establish, publish and maintain API design framework(s) to facilitate the automation of data sharing and data access for cities and communities to enable the development of (new) services and solutions.

#### Recommendation #17

Support and/or promote best practices among stakeholders, at an early stage of any (new) service design, development and implementation phase.

- **Cultural interoperability** refers to the approach taken by individuals and organisations to take into consideration their social and cultural differences and, if applicable, organisational cultural differences. Interoperability can be impacted by cultural differences, as individuals and organisations can respond differently to the same interoperability challenge. These cultural differences can, for example, be reflected in political challenges and leadership styles. Different actors within a smart city can have varying views on how leadership, in the context of interoperability, is exercised. This requires a debate among the actors involved about how to exercise leadership in their interoperability context.

#### Recommendation #18

Ensure that diverse stakeholders (inhabitants, businesses, visitors, organisations and cities/communities administrators) are involved in a multidisciplinary process of definition and/or design of interoperable services so that societal and cultural differences (organisational, economic, ethnic, religious beliefs, gender, language) are accounted for.

#### Recommendation #19

Monitor and audit software codes and ensure transparent and accountable use of AI algorithms, to avoid biases (economic, ethnic, religious beliefs, gender, etc.) that can discriminate people.

- **Legal interoperability** is about ensuring that individuals and organisations, be they public or non-public organisations, operating under different legal and regulatory



frameworks, procurement rules, policies and strategies, can work together. Policies, regulations and legislation should enable the establishment of services within a SCC and between different SCCs, rather than being an obstacle. There is a need for clear agreements about how to deal with differences in policies, regulations and legislation across SCCs, including the option of putting in place new policies, regulations and legislation. The sharing of data is for example strongly influenced by legal interoperability, as this requires the development and use of data licences.

#### Recommendation #20

Put in place a solid and trusted legal framework to enable and facilitate data sharing across stakeholders and across domains at local, regional, national and European level.

#### Recommendation #21

Communicate the right to access and reuse of solutions, data, tools and services. The legal permission for facilitating access and reuse, such as Creative Commons Licenses, should be standardised as much as possible.

- **Organisational interoperability** refers to the way in which organisations align their processes, responsibilities and expectations to achieve commonly agreed goals. Organisational interoperability means documenting, integrating or aligning processes and exchanging relevant information. Organisational interoperability also aims to meet the requirements of users by making services available, easily identifiable, accessible and user-focused. Furthermore, active involvement of the user community can be part of the organisational interoperability component.

#### Recommendation #22

Put in place an organisational structure to establish and maintain clear roles and responsibilities of processes to deliver services at local level.

- **Semantic interoperability** ensures that the precise format and meaning of exchanged data and information is preserved and understood throughout exchanges between individuals and organisations. Semantic interoperability covers both semantic and syntactic aspects: The semantic aspect refers to the meaning of data elements and the relationship between them. It includes data models, controlled vocabularies and common code lists to describe data exchanges and ensures that data elements are understood in the same way by all communicating parties. The syntactic aspect refers to describing the exact format of the information to be exchanged in terms of grammar and format.

#### Recommendation #23

Work towards a commonly agreed description and understanding of the solutions, data, tools and services (format, meaning of data, relationship between parties), across stakeholders and across domains at local, regional, national and European level.

- **Technical interoperability** refers to the inclusion of interface specifications, interconnection services, data integration services, data presentation and exchange, and secure communication protocols. Furthermore, when applying standards they should be

available in an open format. Open technical specifications should be tailored to the specific context in which they will be used. For example, from a technical interoperability point of view, the Minimal Interoperability Mechanisms (MIMs Plus) and the Connecting Europe Facility Building Blocks, based on commonly agreed open standards and open technical specifications, ensure achieving interoperability of data, systems, and services between cities and suppliers around the world, and can guide those working on interoperability in a SCC ecosystem.

#### **Recommendation #24**

Create more horizontal services towards local data platforms, to overcome silos within different domains, by encouraging collaboration and engagement among inhabitants, business, visitors, organisations and city/community administrators.

#### **Recommendation #25**

Develop and provide seamless services where inhabitants, businesses, visitors and organisations are able to identify and authenticate using eID schemes.

#### **Recommendation #26**

Use commonly agreed open standards and open technical specifications for achieving interoperability of data, systems, and services, to support cities/ communities and suppliers during the design, development and implementation phase of new services or reengineer existing ones (to avoid ‘reinventing the wheel’).

#### **Recommendation #27**

Use and raise awareness of the benefits of open standards and open technical specifications amongst SCC service providers, during the design, development and implementation phase.

#### **Recommendation #28**

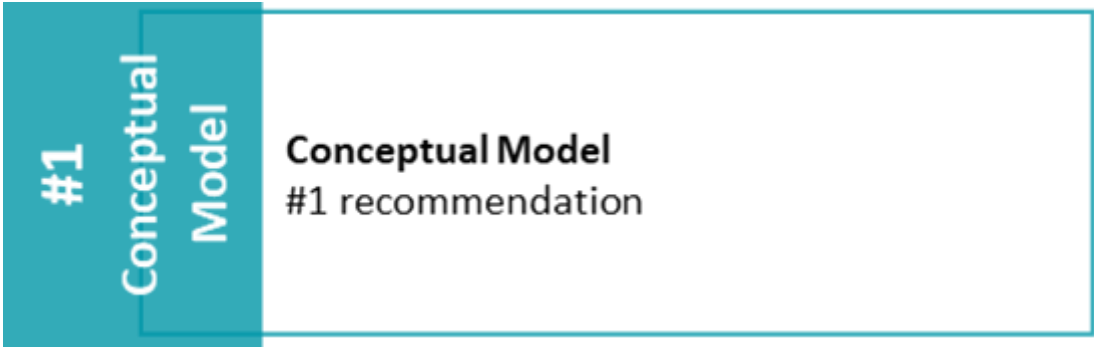
Ensure a local level playing field for open source software and demonstrate active and fair consideration to increase the quality and interoperability solution and become more cost-efficient.

#### **Recommendation #29**

Develop apps/ digital services ensuring that these are open by default (even if not using open standards and open technical specifications, the apps/ digital services should allow integration with others through APIs, to boost the digital transformation at local level).

**6. 6. TAILORED CONCEPTUAL MODEL FOR INTEGRATED SCC SERVICES**

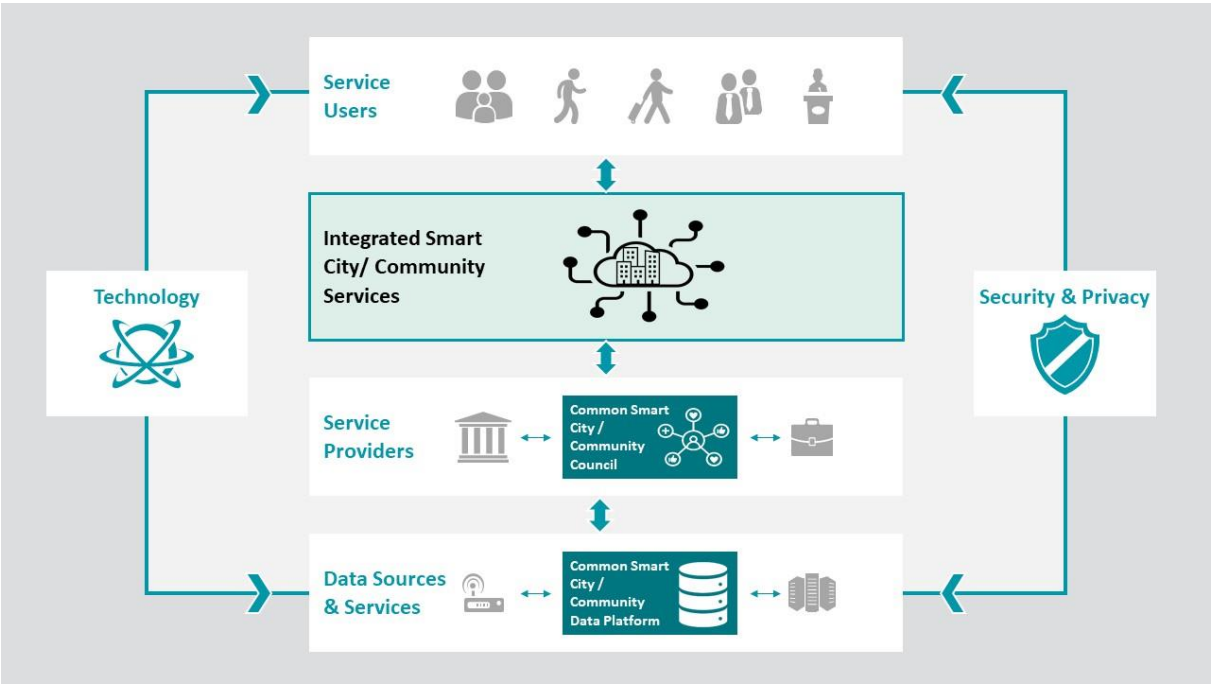
*Figure 8 - EIF4SCC Conceptual Model*



To make the EIF4SCC actionable, this section introduces a conceptual model for Integrated SCC Services (Figure 9). It aims to support the understanding of local administration leaders for the planning, development, operation and maintenance of Integrated SCC Services by applying the EIF4SCC concepts, principles and elements. The conceptual model is developed from a generalised SCC ecosystem perspective and serves as a generalised model that may need to be adapted according to the specific context of local administrations.

The conceptual model is in line with the 2017 European Interoperability Framework and proposes the idea of ‘interoperability by design’, meaning that the integrated SCC services should be designed in accordance with the proposed model and with interoperability and reusability requirements in mind.

*Figure 9 - Conceptual model for Integrated SCC Services*



The model includes six essential parts and its related interactions. They are 1) Service Users, 2) Integrated SCC Services, 3) Service Providers, 4) Data Sources & Services, 5) Technology and 6) Security & Privacy, and are explained below.

Service Users



1. **Service Users**, such as inhabitants, visitors, businesses, organisations and city/community administrators make use of the services offered by

the Service Providers. Service Users can take an active role by providing their input through co-creation and coproduction processes in the Integrated SCC Services. Service Users can also provide their input via technology, which might lead to improved services offered to them. This dynamic implies a continuous exchange of data, guarantying security and privacy.

**2. Integrated Smart City/Community Services** are

services offered to Service Users by Service Providers. Integrated SCC Services may be offered by the public sector or though collaboration between the public and non-public sector. Examples range from the development of services that are cloud-based and provide a user-friendly interface for Service Users to the development of a Local Digital Twin. A Digital Twin is a digital copy of the city or community that allows policy decisions to be tested in a digital environment. These services can make use of building blocks that are available for reuse. Examples of such building blocks are the Digital Europe Programme and ISA<sup>2</sup> solutions and the Connecting Europe Facility (CEF) Building Blocks, which offer basic capabilities and can be used in any European project to facilitate the delivery of digital public services across borders. Examples of ISA<sup>2</sup> and CEF Building Blocks include the Core Vocabularies<sup>18</sup>, eSignature<sup>19</sup> and eInvoicing<sup>20</sup>.



Service Providers



3. **Service providers**, such as local public administrations, businesses and societal actors can provide a great variety of services to **Service Users**. Those services range from the

registration of the birth of a child, to the waste collection at your home or the management of the streetlights during the night. The interaction between Service Providers and Service Users in the SCC can occur within a Common SCC Council. The aim of the Council is to facilitate the delivery of services in the SCC.



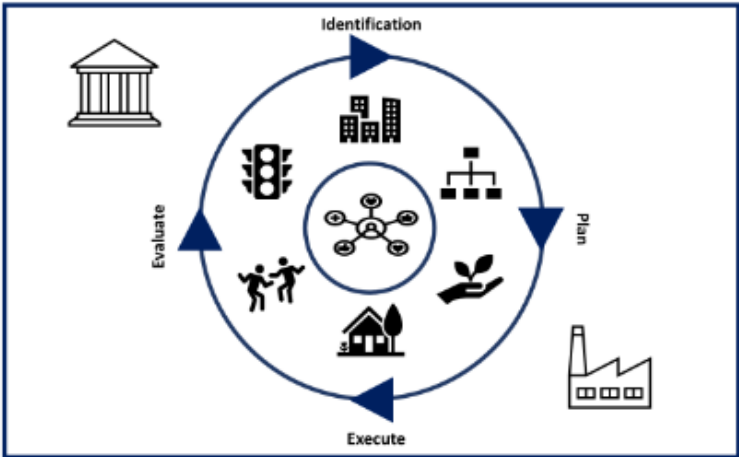
The Common SCC Council provides an interaction stage for Service Providers and Service Users. This Council can take a leading role in identifying service needs, in planning how to handle service needs, in executing the plans regarding services and in evaluating the achievement of the objectives.

Considering that the Common SCC Council is an interaction ground in the relation between the Service Users and Service Providers, it is important to reflect on the organisation of the Council. The different actors of a SCC should decide on how they want to organise the Council so that it can function according to their needs and context. This interaction can lead to co-creation and coproduction processes. Figure 10 offers a detailed view of the Common SCC Council. The Council can be developed taking into account different possible service

<sup>18</sup> <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/core-vocabularies>  
<sup>19</sup> <https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eSignature>  
<sup>20</sup> <https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eInvoicing>

domains as well as the interactions between those domains – think of Smart Economy (e.g. entrepreneurship, economic growth and value creation), Smart Governance (e.g. public participation, public-private partnerships, transparent governance), Smart Environment (e.g. waste management, sustainable energy use, water resilience), Smart Living (e.g. housing quality, urban safety, educational quality, cultural facilities), Smart People (e.g. skills & talented human capital, a caring community) and Smart Mobility (e.g. public transport systems, efficient road accessibility).

Figure 10 - Common SCC Council



**4. Data Sources & Services** consists of two aspects. The first aspect is focused on the **data sources** available in a SCC. Data can be gathered by both

Service Providers and Service Users, through Smart Sensors, Internet of Things, Software Applications, etc.

Data can be classified as open, shared or closed, depending on privacy and security considerations.

- **Open data** is available for reuse by third parties with minimal restrictions. In the EU, the concept of open data denotes the specific relationship of public administrations opening their data with a minimum set of restrictions towards third parties (whereby limited financial compensations can still apply)<sup>21</sup>.
- **Shared data** is an intermediate category. This is data that is not shared as open data, but it is available for third parties while respecting certain conditions. Those conditions are more restrictive than those governing open data.
- Finally, **closed data** has a restricted use and cannot be shared with third parties.

The sharing and opening of data can apply to all actors in the smart city or community. Public administration actors can share data with non-public administration actors and *vice versa*. Data should be structured in data catalogues that support service providers to find reusable data sources. Data from public administration can be recognised in the format of a base registry. A base registry is a trusted and authoritative source of information which can and should be digitally reused by others, where one actor is responsible and accountable for the

<sup>21</sup> An overview of the applicable legislative framework concerning open data can be found at: <https://digital-strategy.ec.europa.eu/en/policies/legislation-open-data>

collection, use, updating and preservation of information. From the perspective of non-public administration, it could also be relevant to reflect on the possibilities offered by the development of base registries. This requires the necessary legal framework and agreements with the public administration actors. Base registries can facilitate the application of the once only principle, the reuse of data and documents that service users have already supplied, in a transparent and secure way.

In line with data, services can be classified as open, shared or closed.

- When services are available in an open format, they can be reused by third parties with a minimal set of restrictions.
- Shared services are also reusable, but the reuse will be restricted to certain conditions – e.g. time limitations, allowed number of users, restrictions on which type of actors can reuse it.
- Closed services are not available for reuse by third parties.

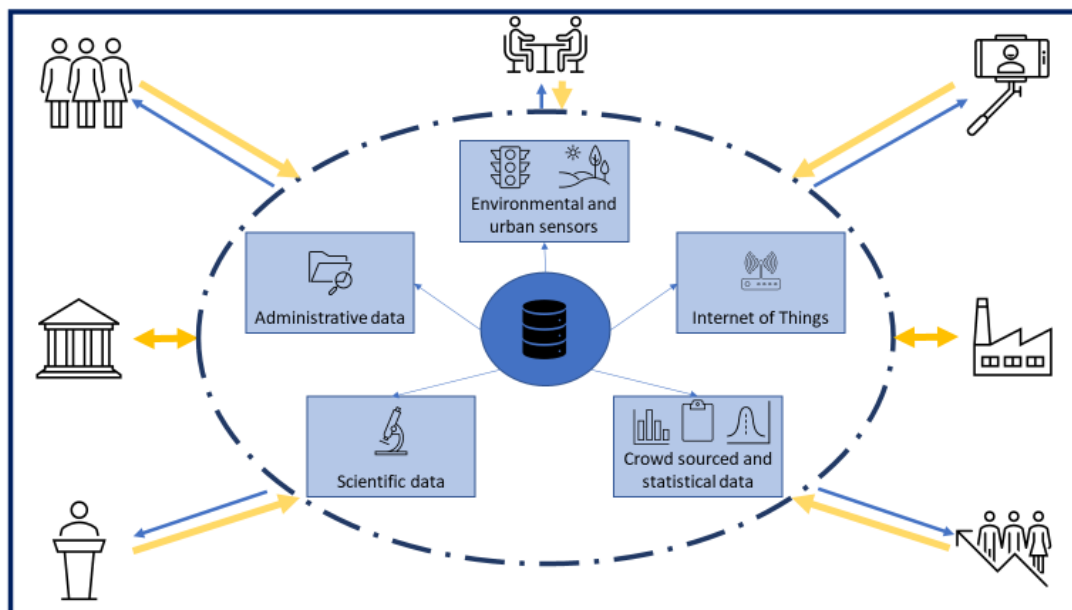
The European Commission, as well as national and regional public administrations, have developed building blocks. These are services that are available to both public administration and non-public administration actors for reuse. Building blocks can be available in an open or in a shared format. These building blocks allow the Service Providers to offer Integrated SCC Services to the Service Users in a standardised way. The reusable building blocks lead to a higher efficiency for the Service Providers, and to a possible increase in the user-friendliness for the Service Users.

Data and services can be shared among the different SCC actors in a **Common SCC Data Platform**, also known as a Local Data Platform or Space. This Platform, established by Service Providers, facilitates management and sharing of city/community data and services. This can be done in line with the governance approaches of the Common SCC Council. The difference between the Common SCC Council and this Data Platform lies in the fact that the Common SCC Council is focused on the overall organisation of the SCC and the services offered in it. In contrast, the Data Platform focuses on the exchange of data and services. Both are as such complementary to each other.



Figure 11 provides a detailed view of this Common SCC Data Platform. The main beneficiaries of this Data Platform are Service Providers, who feed in and use data from the Data Platform to develop and offer services. The dotted line in Figure 11 indicates that the data reused from the Data Platform can be offered under specific reusability conditions. Together with the Service Providers, Service Users play a key role in the Data Platform. Via their overall behaviour within the SCC and the use of services offered to them by the Service Providers, the Service Users provide data to the Data Platform. The privacy and security of data is of crucial importance and can be improved via the Platform. Since the Service Providers tend to provide more data to the Data Platform when compared to the data they use, the yellow arrow is wider than the blue arrow. Different types of data can be available in the Data Platform – including administrative data, scientific data, crowd-sourced and statistical data, data collected via Internet of Things (IoT) or data collected via environmental and urban sensors.

Figure 11 - Common SCC Platform



### Technology



**5. Technology** has, together with Security & Privacy, a fundamental role in the set-up of the Integrated SCC Services. Both aspects have a relevant impact on the process of creating Integrated SCC Services offered by the Service Providers to the Service Users. The Technology allows for the collection, storing, sharing, updating and preservation of data, and creates the possibility to build reusable services. It allows the Service Providers to create Integrated SCC Services for the Service Users and gives the possibility to the Service Users to take an active role in the creation of those services. Examples of technology that is relevant in a SCC context are Artificial Intelligence, Big Data, Blockchain, Cloud computing, High performance computing, Digital Twins, Data Integration platforms, Internet of Things, Mobile applications, etc.

### Security & Privacy



**6. Security & Privacy** are primary concerns in the provision of services, and both the public administration and non-public administration actors need to ensure that a privacy-by-design and security-by-design approach is followed. It should also be ensured that services are not vulnerable to attacks and that the services are compliant with [contractual and] legal requirements and obligations regarding data protection and privacy. Like Technology, Security & Privacy impacts not only the City/Community Data Sources & Services, but also the relation between the Service Providers and the offering of Integrated SCC Services to the Service Users.

### Recommendation #30

Use the conceptual model for Integrated Smart City and Community Services to support the design of new services or update existing ones and reuse, where possible, existing data, service building blocks and digital solutions such as CEF Building Blocks, Digital Europe Programme and ISA<sup>2</sup> solutions.

**7.7. CONCLUSION**

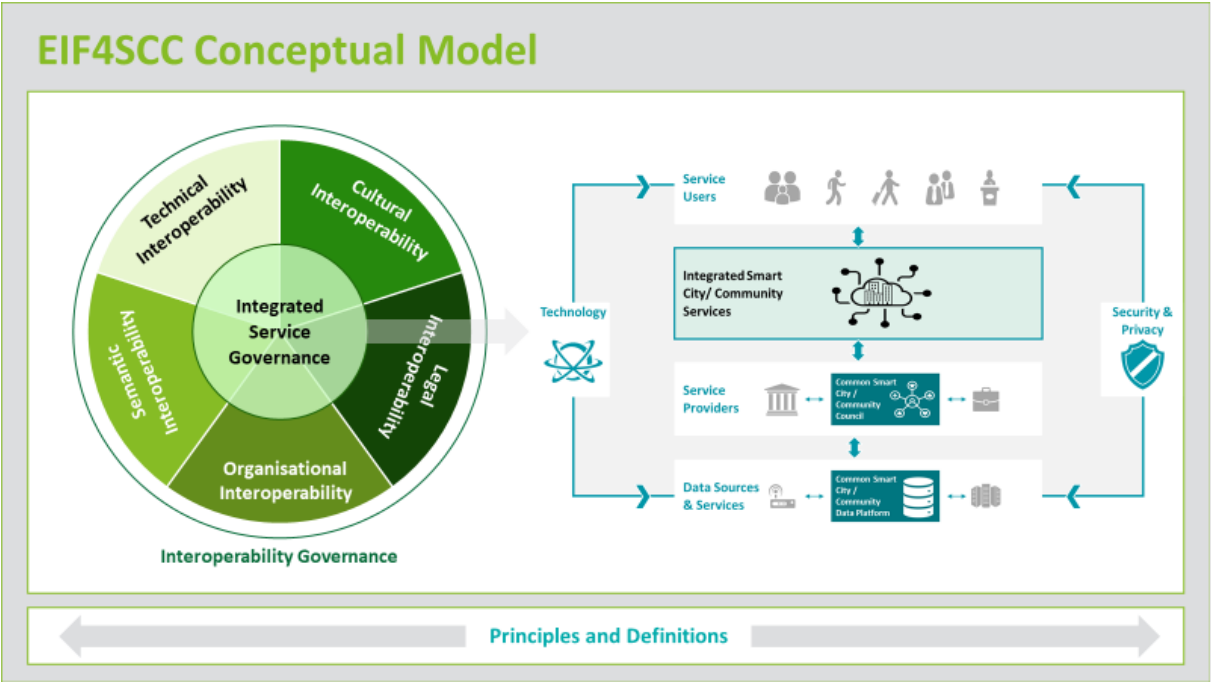
Cities and communities play a fundamental role in the life of European Union citizens. Public administrations in cities and communities are the closest to the inhabitants, businesses and visitors and have a key role in the creation of value for through the delivery of services. The vast growth of digital solutions and technological advances of the previous decades have seen local administrations begin their transition towards becoming a smart city or community and has demonstrated the importance of interoperability.

Interoperability is a prerequisite for electronic communication and the exchange of information between different actors, but as we have seen, it is much broader than technical in nature. Taken in the broader sense as presented in the EIF4CC, interoperability is a necessary condition for achieving and further developing Smart Cities and Communities in Europe.

The EIF4SCC (see Figure 12) provides European Union local administration leaders with a guide to interoperability. It includes principles, a common interoperability model and recommendations to enable interoperability across domains, cities, regions and borders, leading to improved delivery of services to inhabitants, visitors, businesses and city/community administrators. The EIF4SCC is part of a wider range of initiatives taken by the European Commission to facilitate the development of SCCs as well as the interoperability within and across public administrations, and private actors in the smart city and community context. The EIF4SCC must be seen as a complementing effort of the European Commission to stimulate and contribute to interoperability from a local, regional, national, European and global perspective.

The EIF4SCC is premised on the fact that that interoperability goes beyond ICT matters. The EIF4SCC identifies seven elements of interoperability (cultural, legal, organisational, semantic and technical, one cross-cutting layer, all built on the foundation of Interoperability Governance).

*Figure 12 - EIF4SCC Conceptual Model*



The EIF4SCC involves governance factors to ensure coordination of relevant activities across all domains of a SCC. The Conceptual Model for Integrated SCC Services aims to facilitate



this governance support by providing local administration leaders with a framework that help in the planning, development, operation and maintenance of integrated SCC services.

Besides the EIF4SCC recommendations, local administrators are also encouraged to follow and to contribute to other initiatives. One of these is the Living-in.EU movement, a commitment in which decision makers can join forces to boost sustainable digital transformation in cities and communities in the EU and together develop sustainable measures. This also includes exchange of knowledge and sharing best practices around interoperability solutions in the cities.

The activities conducted by the European Commission to progress interoperability are a continuous learning path. Therefore, this is a living document that will need to be updated on the basis of the input provided by local administrations, the evolution of ICT and public administrations and the development of new insights on interoperability. Furthermore, it has to be underlined that in light of the EIF, which targets only public administrations, the EU Member State administrations have developed National Interoperability Frameworks. Local administration leaders are encouraged to participate in the overarching National Interoperability Framework of their Member State.

The EIF4SCC as such fits into the multi-level governance context of the EU, where all levels of public administration play a key role in achieving interoperability at local, regional, national, European and global level. Taking an approach which considers interoperability from the beginning, means being better prepared to tackle complex challenges such as climate change, health issues and socio-economic issues. Therefore, it is important to see interoperability as a facilitator of present and future actions or initiatives such as the European Green Deal<sup>22</sup> or the Digital Single Market<sup>23</sup>.

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<sup>22</sup> [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en)

<sup>23</sup> <https://ec.europa.eu/digital-single-market/en>