



Analysing the potential for wide scale roll out of integrated Smart Cities and Communities solutions

Public procurement models for SCC solutions

Report D8.2

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List of acronyms

EC	European Commission
EoI	Expression of Interest
ICT	Information and Communication Technologies
ITS	Intelligent Transport System
MS	Member State
PCP	Pre-Commercial Procurement
PPI	Public Procurement of Innovation
PPP	Public Private Partnership
R&D	Research & Development
RD&I	Research, Development and Innovation
SC	Smart City
SCC	Smart Cities and Communities
SLA	Service Level Agreement
SME	Small and Medium-sized Enterprises

1. Introduction

This report seeks to provide an understanding of how public procurement models affect integrated SCC solutions. The analysis and findings are presented according to the following structure:

Chapter 2: General context

This section describes the main forms of public procurement (in terms of models and procedures). It defines and describes both the traditional and the newer approaches, including public procurement of innovation (PPI).

Chapter 3: Main insights supported by real cases

Based on the case studies developed as part of the overall research work of this project and on the outcomes of a stakeholder consultation, this chapter analyzes the main trends and findings with respect to how public procurement models affect SCs and SCC solutions.

Chapter 4: Conclusions and recommendations

The final chapter of this report draws conclusions from the analysis and turns these into a set of seven key recommendations and operational guidelines intended for both the European Commission and National/City Authorities.

2. General context

2.1 Public procurement, innovation and SCCs

Municipal authorities rely strongly on external suppliers, a trend that is growing as local authorities increasingly define themselves as commissioners and not deliverers of services. In the field of Smart Cities (SCs), **the creation and development of a SC solution requires a continuous innovation process involving high numbers and different categories of stakeholders.** One way the public administration can foster this kind of innovation process is by using **public procurement as a tool to stimulate innovation from the demand side**, thereby supporting state-of-the-art SC projects and solutions.

This is particularly true for SCs, which are characterized by areas of application where public authorities have a strong potential to stimulate demand (e.g. the transport and the energy sectors). Moreover, public authorities may not only buy a product, they can also make a request for products that are not available yet, generating innovative dynamics and solving market failures.

Therefore, it is clear that **Europe has an enormous and overlooked opportunity to spur innovation by using procurement.** However, as SC solutions are by definition multi-component systems, their procurement may sometimes be complex. This may be due to the current EU legislation which – in order to ensure transparent procurement processes and free and open competition in the bidding process – limits the municipal authority's ability to interact with the private and the civil sector. Other causes may include:

- Legacy processes;
- A preference for large integrated contracts;
- An aversion to working with unproven ideas or unknown suppliers.

These issues have all created barriers to new players accessing this market. Combined with the need for integrated and systemic solutions such as those of SCs, this presents a major challenge to local authorities, which have traditionally developed responses through a silo approach.

Evidence for the relationship depicted above is that, historically, it has been difficult for newly founded firms to win business from public bodies like municipal governments. Therefore, it seems that **public sector procurement practices themselves can represent a significant obstacle to accelerating the growth of SCs.** From both the public and private sector sides of the market, there is some evidence that traditional procurement of city services is stifling innovation and inhibiting the ability of cities and industry to jointly undertake real life R&D and to pool intellectual property for mutual benefit. Equally, there is an increasing consensus on new, smarter approaches to public procurement, which are already starting to develop and should be more widely adopted.

Avoiding lock-in

Vendor lock-in is a phenomenon that takes place when **a public authority is unduly dependent on a single supplier, vendor or developer** beyond the timeframe of the initial procurement contract, damaging competition for future procurement. This happens in cases such as:

- Long contracts that encourage up-front capital investment to build bespoke tools and that depreciate over a number of years;
- One supplier entrenched over a number of years to provide mission critical systems, using specific brand names of products in procurement documents, and requesting backward compatibility with proprietary systems of which only a few suppliers have knowledge. This implies that the costs to the public authority of migrating to products or systems of another supplier are prohibitively high, even if the alternative option has significant advantages with respect to the existing one.

By limiting the procurement choices of public authorities to certain vendors and the suppliers of their products, lock-in can reduce the ability of other market participants to compete in contracts for public procurement. This in turn can lead to lower levels of innovation, and higher prices. **Lock-in, as well as increasing costs, reduces the available supplier base, excludes new and innovative companies from providing alternative solutions and causes the market to stagnate.**

ICT standards may play an important role in preventing reliance on single vendors for products and system components that implement desired technologies by **identifying the key element of the technology required and ensuring that its use is not limited to a specific product or service**. Procuring a product from one supplier that is based on standard technology helps to ensure that future purchases are not limited to the original supplier, as others are also able to implement the technology. Public authorities should therefore make the best use of the full range of relevant standards when procuring ICT products and services, such as those concerning SCC solutions. The provision of standards could reduce several barriers to smart cities implementation. However, standards need to be made easily accessible to stakeholders in order to accelerate SC projects.

High-performing city governments increasingly recognize the value of acting as customers of innovation. Opening up procurement mechanisms to make them accessible to younger, smaller businesses allows cities to access a wider range of new ideas and technology than traditional market procurement. As a result, cities have been looking for new ways to ensure innovation is built into the actual procurement process, as is explained in the following paragraphs.

In the procurement of SC products and services (e.g. retrofitting of public sector buildings, smart energy grids, electric vehicle charging infrastructure, installation of heat networks, renewable energy generation), cities may adopt two models:

- Traditional procurement;
- Public procurement of innovation (PPI).

Before carrying out one of these two traditional forms of procurement, cities may carry out a **preliminary market consultation, whose aim is to gather information from the market and inform potential suppliers about future procurement opportunities**.

2.2 Traditional procurement

Traditional procurement, which can be used both for an initial pilot and for a full procurement action, typically occurs as either an open or a restricted procedure, as describe in Table 1 below.

Table 1: Traditional procurement procedures

	Aim	When to use	Process	Procurement Directive
Open	A single stage process where authorities issue full tender documents open to all entities interested in submitting an offer. No negotiations are allowed and only tenders including all the necessary documents can be considered for further evaluation.	All cases in which the use of PPI is not required, namely when the characteristics of the solution to be acquired are sufficiently defined and clear.	<pre> graph LR A[Publication of tender notice.] --> B[Establishment of evaluation committee.] B --> C[Opening session and evaluation.] C --> D[Award and contract signature.] </pre>	Any business may submit a tender.
Restricted	A two-stage process where the contracting authority can specify the type or number of entities allowed to submit a tender offer. Any business may ask to participate, but only those who are pre-selected will be invited to submit a tender.		<pre> graph TD subgraph 1st_stage [1st stage] A[Publication of call for Expression of Interest (EoI).] --> B[First screening based on the call for EoI.] end subgraph 2nd_stage [2nd stage] C[Publication of tender notice.] --> D[Establishment of evaluation committee.] D --> E[Opening session and evaluation.] E --> F[Award and contract signature.] end B --> C </pre>	Only businesses selected in the first stage may submit a tender.

Source: Our elaboration based on Directive 2014/24/EU

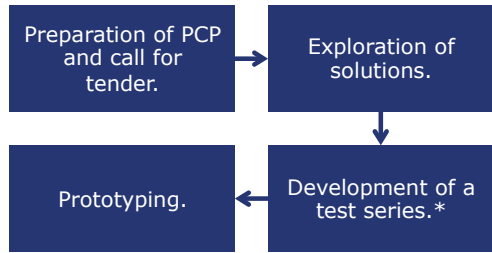
2.3 Public procurement of innovation

The purchase of innovative solutions for SC applications entails a more tailored concept of procurement, i.e. public procurement of innovation (PPI). This type of procurement emphasizes the need for shared visions, as well as collaboration from and early commitment by the municipal departments. In this model, the latter take on the role of accelerator, collaborating in the innovative ecosystem.

The use of PPI applied to the local and SC context brings clear advantages to the different parties involved. For city authorities, it enables the promotion of urban growth and citizen well being, whilst from the private providers' perspective it fosters internal capacity and boosts export potential. Smaller cities can also benefit from clearer benefits as a result of PPI, in terms of capacity building and creating competencies and networks, and fostering short-term demand. Moreover, PPI makes it possible to provide suppliers with an early evaluation of their product. It also enables procurers to compare different solutions and avoid lock-ins.

Within the framework of PPI, four major procedures can be identified and they are described in Table 2 on the following page.

Table 2: PPI procedures

	Aim	When to use	Process	Procurement Directive
Pre-commercial procurement (PCP) (also referred to as "contract" research)	Procurement of R&D services, from prototype to first test, before they are commercially available. This means that if the developed good/service were to be procured, it would require a separate tender. ¹	May encourage the market to develop new solutions , so it is suitable when market consultation activities indicate that there is currently no solution. May also include the acquisition of the limited prototypes and/or test products developed, but it does not include the acquisition of a larger volume of resulting end solutions on a commercial scale and must not constitute state aid .	 <pre> graph TD A[Preparation of PCP and call for tender.] --> B[Exploration of solutions.] B --> C[Development of a test series.*] C --> D[Prototyping.] </pre> <p>* Includes assessment, publication, standardization, and payment for final phase.</p>	<p>It does not constitute state aid, provided that:</p> <ul style="list-style-type: none"> ▪ The benefit of the R&D services does not accrue exclusively to the contracting authority; ▪ The value of the procured R&D services is >50% of the total value of the project; ▪ R&D costs are procured at market price (i.e. do no State Aid elements); ▪ The procedure may not be used to test existing prototypes, but only prototypes requiring further development; ▪ The principles of transparency, non-discrimination and equal treatment are observed.

¹ This not a specific tendering procedure but an approach presented by the European Commission (EC) in its Communication *Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe* (COM(2007) 799 Final: http://ec.europa.eu/invest-in-research/pdf/download_en/com_2007_799.pdf), which outlines how to organise the procurement of R&D services within the legal framework provided for by the EU Procurement Directives.

	Aim	When to use	Process	Procurement Directive
Competitive dialogue	Awarding a contract to suppliers, for services or works following a dialogue with selected participants, who have submitted an offer according to the needs outlined by the public authority.	Often used for large complex projects where the technical specifications cannot be adequately defined in advance.	<div>Selection</div> <div>Publication of contract notice.</div> <div>Selection of operators for dialogue.</div>	<p>It is allowed when:</p> <ul style="list-style-type: none"> The needs cannot be met by adapting available solutions; The need includes design or innovative solutions; Prior negotiation is required due to the nature of the project; Complexity/high risk/legal or financial make-up; Technical specifications cannot be defined in a precise manner; Irregular or unacceptable tenders are submitted.
			<div>Dialogue</div> <div>Rounds of dialogue and (optional) operator reduction.</div> <div>Issue of descriptive document.</div>	
			<div>Award</div> <div>Closure of dialogue.</div> <div>Invitation of final tenders.</div>	
			<div></div> <div>Selection of bidder and confirmation of terms.</div> <div>Fine-tuning of offers.</div>	
Competitive procedure with negotiation	Procuring products, services or works including elements of adaptation, design or innovation , which necessarily requires negotiation. Compared to competitive dialogue, the required characteristics need to be specified prior to the competition.		<div>Selection</div> <div>Publication of call for competition with requirements.</div> <div>Selection of operators for negotiation.</div>	<p>Introduced in the 2014 directives, replacing the negotiated procedure with prior publication of a notice.</p>
			<div>Negotiation</div> <div>Negotiations and (optional) operator reduction.</div> <div>Rounds of written submissions.</div>	
			<div>Award</div> <div>Notification of conclusion of negotiations.</div>	
			<div>Development</div> <div>Product/service development.</div> <div>Commercial acquisition.</div>	

	Aim	When to use	Process		Procurement Directive
Innovation partnership	Researching, developing and procuring new products and services on a commercial scale . It allows for the award of a phased contract covering all stages, from R&D to the acquisition of commercial volumes of the finished products/services.	Can be set up when a contracting authority has a need for an innovative product, service or works that cannot be met by purchasing products, services or works already available on the market.	Selection	Publication of call for competition with requirements. → Selection of operators for negotiation.	The rules for establishing an Innovation Partnership are specified in the directives and involve the use of a competitive procedure with negotiation.
			Negotiation	Negotiations and (optional) operator reduction. ← Rounds of written submissions.	
			Award	Notification of conclusion of negotiations.	
			Development	Product/service development. → Commercial acquisition.	

Source: Our elaboration based on Semple, A. (2014) *Guidance for public authorities on Public Procurement of Innovation*. European Commission. ICLEI - Local Governments for Sustainability. Available at: https://www.innovation-procurement.org/fileadmin/editor-content/Guides/PPI-Platform_Guide_new-final_download.pdf

3. Main insights supported by real cases

3.1 Procurement models and SC project domains

A categorisation has been made that dividing the different procurement models adopted by the case studies analysed into 7 major clusters, namely:

- Preliminary market consultation;
- Pre-commercial procurement;
- Competitive dialogue;
- Competitive procedure with negotiation;
- Innovation partnership;
- Open procedure;
- Restricted procedure;
- No procurement.²

The majority of respondents of the stakeholder consultation carried out for this study (72%)³ report that PPI procedures were relevant for their solution. Within the three major domains of SC projects (i.e. Sustainable Districts and Built Environment, Sustainable Urban Mobility, and Integrated Infrastructure), **a particularly popular model appears to be the innovation partnership for Integrated Infrastructure across ICT, Energy and Mobility.**⁴ The Sustainable Districts and Built Environment⁵ as well as the Sustainable Urban Mobility⁶ domains are characterized by a similar distribution of procurement models. These findings are shown in Figure 1 below.

It is worth noting that none of the solutions analyzed use the restricted procedure, and that most of the solutions that do not use public procurement are in the domain of Integrated Infrastructure across ICT, Energy and Mobility. In the Sustainable Districts & Built Environment and the Sustainable Urban Mobility domains, it seems that most solutions were purchased using PPI.

² This may be for a variety of reasons, including the fact that the consortium includes players able to provide components or expertise, which therefore did not need to be acquired from the market. It might also be due to the fact that some SCC solutions are privately owned, and therefore do not require public procurement.

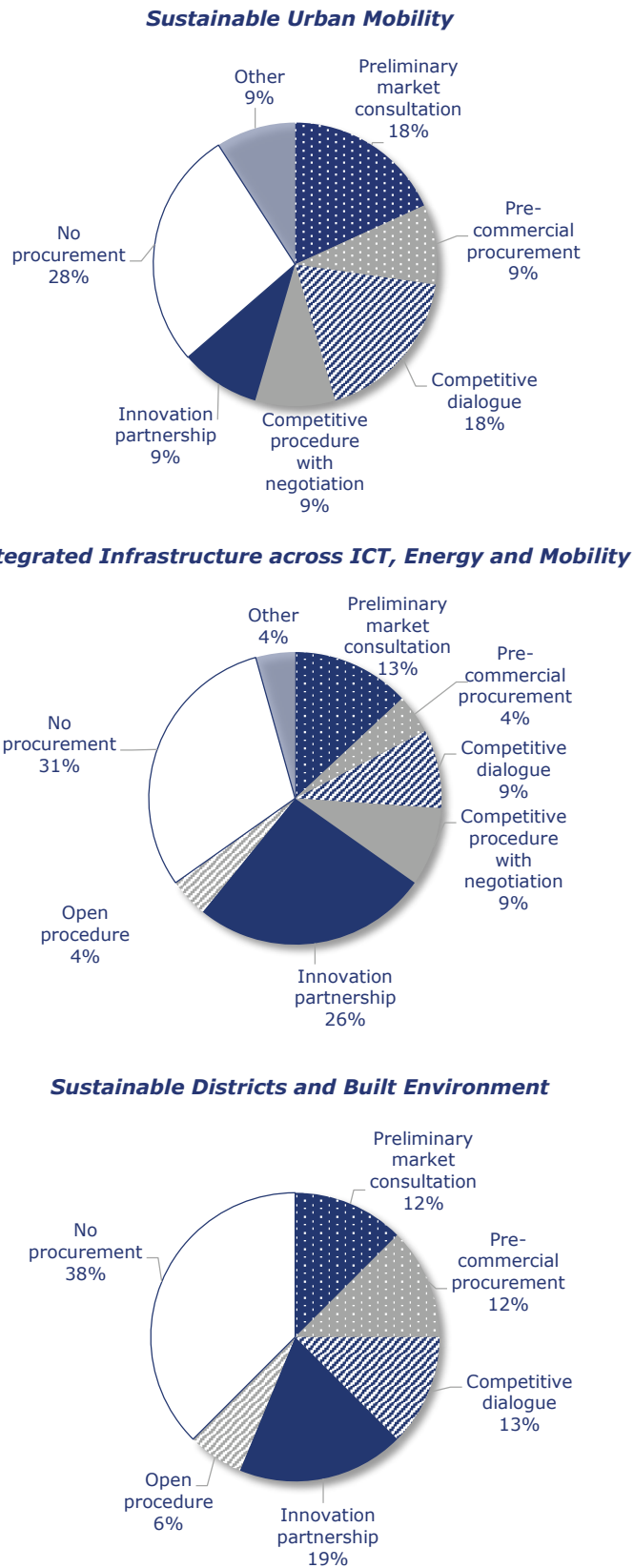
³ This percentage is calculated as the number of cases that used the PPI models (i.e. PCP, competitive dialogue, competitive procedure with negotiation, and innovation partnership), over the total number of cases that used procurement (i.e. all except those that answered "No procurement" and "Other."

⁴ This includes projects that involve the integration of ICT and common shared infrastructure.

⁵ This includes projects that involve intervening on the existing building stock with the aim of improving energy efficiency, generating low carbon energy, modernizing infrastructure and creating high quality living environments. Interventions to find energy efficient, low carbon solutions for new buildings and districts are also included.

⁶ This includes projects that involve the creation of an efficient and integrated mobility system that makes it possible to seamlessly organize and monitor transport across different modes.

Figure 1: Procurement models across the three major domains of SC projects



Source: Our elaboration

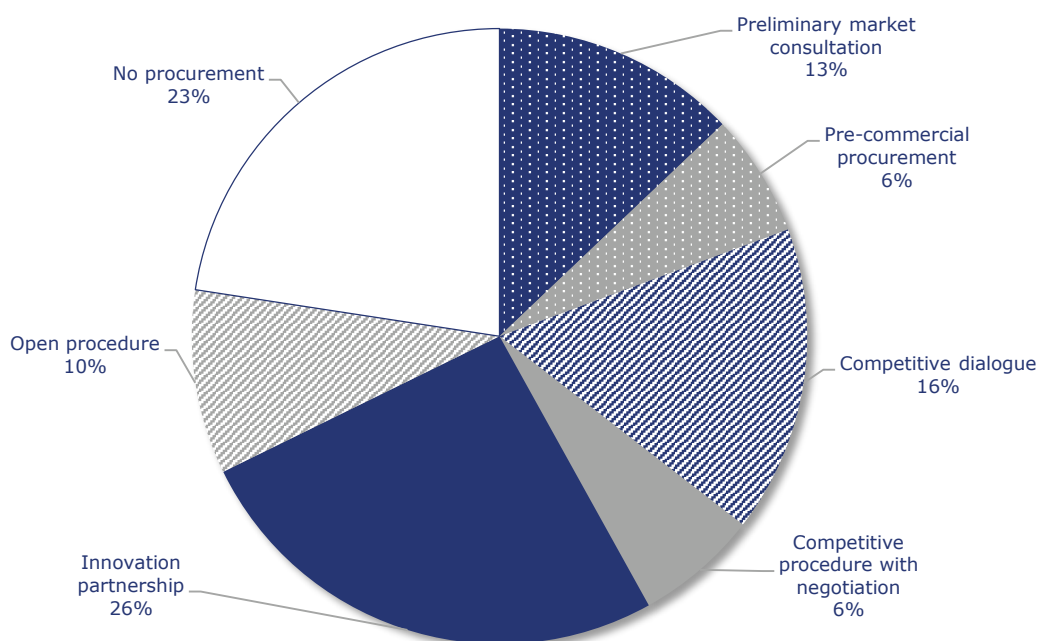
3.2 Procurement models adopted by SCC solutions

Also notable is the fact that PPI adoption was reported by 61% of respondents, whereas traditional forms of procurement were employed in only 10% of cases. Furthermore, 23% of respondents reported that they did not use any procurement at all. As illustrated in Figure 2 below, this phenomenon is substantiated by the **innovation partnership model representing the largest share of procurement models adopted** in the case studies. Coherently with this, preliminary market consultations, competitive procedures, negotiations and competitive dialogue follow in terms of market share.

Besides market consultation – which is not a “pure” procurement method, given that it aims to gather information from the market with a view to later procurement – all others are innovative procurement models, particularly suited to SCC solutions. Their extensive use (according to these statistics) means that, when a public authority sought a SCC solution, it felt “sufficiently” uncertain (e.g. legal and financial set-up of the contractual relationship with the supplier) even after a market consultation.

Such models, although more slowly implemented, especially if the authority is using them for the first time or does not have adequate capacity, have the clear advantage that they allow **greater interaction with the market** in order to refine requirements and award a contract, compared to open or restricted procedures.

Figure 2: Procurement models adopted by SCC solutions



Source: Our elaboration

3.2.1 Innovation platforms

With regards to the innovation partnership model, **innovation platforms** (also called participation platforms) are of particular interest: public authorities are increasingly adopting these tools to facilitate their procurement procedures. The case study presented in the box on the following page presented the use of an innovation platform in the city of **Copenhagen**.

The use of an innovation platform in Copenhagen, Denmark

By 2025, Copenhagen's ambition is to become carbon neutral. To meet this goal, many activities need to be developed and implemented and the City Hall wants to play the role not only of the policy developer but also of the procurer of new infrastructure, technologies and services.

With this aim in mind, in October 2013 the Copenhagen Cleantech Cluster and the City of Copenhagen established a strategic partnership to explore new methods for using public procurement. The result of this was the setting up of a platform where companies could meet and get to know each other, and where they could apply their specific knowledge and skills to create solutions together.

The project was based on a **Public-Private Innovation**, a model that can be divided into several phases:

- **Identifying and prioritizing challenges:** The public authority identified and prioritizes challenges.
In this case, Copenhagen's ambition to become a SC was set as the grand challenge.
- **From grand challenge to specific problems:** The public authority collects information about the challenge, as well as ideas on how it might be solved.
In Copenhagen, experts, entrepreneurs and other stakeholders were invited to help to understand the grand challenge in more detail, and break it down into more specific problem areas. The first finding was that citizen engagement and data availability were the most important issues, thereby making it possible to give the platform a better focus.
- **Innovation teams:** Partners and stakeholders with the competencies to contribute to solving this more specific challenge are identified, and possible solutions and barriers are explored in greater detail.
The topics addressed in Copenhagen included data availability, open versus closed standards, business models for establishing a digital infrastructure, waste management, water management, transportation, energy consumption, etc.
- **Procurement and implementation:** Based on the information collected, the next step is to issue a tender for a new solution. The identity of the procurer is not given; it might be a public authority, or an association with public sector backing.
In the case of Copenhagen, a test case was developed in the area of traffic. The city wishes to reduce CO₂ emissions produced from traffic generated by looking for available parking spots.

The public-private partnership gave market parties *carte blanche* with respect to the contents of the innovation. However, a number of rules of play were introduced to ensure that the project would be successful:

- **Collaborate:** Participants were required to form consortiums in order to be part of the bidding process;
- **Business case:** Proposed solutions had to be applicable also outside Copenhagen;
- **Fixed budget:** Each team had a fixed budget, regardless of the type of innovation;
- **Prototype:** Participants had to demonstrate their product/service in the form of a prototype at the end of the project. After that, a field experiment served as the basis upon which to decide whether or not to roll-out the new product/service;
- **Property rights:** Two independent lawyers were available during the Public-Private Innovation to advise participants on property rights.

Based on the experience of the Public-Private Innovation, a 2015-2016 Intelligent Transport System (ITS) Action Plan was drawn, to be employed as a reference for a larger ITS tender. The plan describes themes and focus areas, but not specific solutions or time schedules for the implementation sequence. The prequalification for the tender was launched in January 2015 and the bidding process was held throughout February 2015.

As previously mentioned, the first solutions were in the field of transport. More specifically, the tender gave birth to eight very different solutions (e.g. mobility and green driving, traffic safety, data and traffic management, etc.). Overall, the Copenhagen Cleantech Cluster facilitated a three-month process to develop different scenarios to solve the city challenge. This enables the city to be a very qualified buyer, able to receive the best possible inputs from leading researchers, companies, entrepreneurs and citizens before defining what they wish to buy. It also avoids communication problems, as the government body's intention could be immediately reflected in what market parties had to offer, without the need for consultants and/or advisors. However, a number of points upon which to improve were also identified. For example, the budget set for the eight consortiums was relatively low, and for some parties it therefore precluded the production of real prototypes.

3.2.2 Competitive dialogue and negotiation

As mentioned in chapter 2, not only the innovation partnership but also the **competitive procedures with negotiation and the competitive dialogue⁷ are flexible procedures to use in complex projects** where there is a need for the contracting authority to discuss all aspects of the proposed contract with potential suppliers.

These models allow for **discussion with suppliers and innovators during the tendering procedure, enabling them to develop a solution based on a better understanding of the exact needs of the authority.** Generally, such approaches provide structured tendering processes with more flexibility to develop innovative solutions, allowing for a constructive dialogue between suppliers and contracting authorities. However, **the process requires skilful management:** as it often takes longer than other processes, making it extremely **resource-intensive**, as a dedicated project team will need to meet regularly and for extended periods of time. Moreover, the process of constantly refining the proposals during the dialogue phase requires considerable investment for the economic operators concerned. Accordingly, it is advisable to foresee an adequate reimbursement for the economic operators participating, through, for instance, stipulating in the contract the conditions of payment or prices for the participants at the dialogue.

The case study below provides some insights on how the **competitive dialogue** was carried out in the case study of the city of **Barcelona**.

⁷ The only difference between these two is that the competitive procedure, unlike the competitive dialogue, requires that the authority can specify the required characteristics of the goods or services prior to the competition.

The competitive dialogue procedure adopted in Barcelona, Spain

Given the lack of similar products in the market, the city of Barcelona decided to adopt the competitive dialogue procedure in order to obtain the most appropriate **City OS Urban platform**, a type of ICT architecture that provides a transversal service that interconnects the entire city.

Barcelona adopted this model to innovate and develop the requirements for this system jointly with companies. The competitive dialogue procedure was carried out in stages:

- The process began in April 2013 and 23 enterprises applied; some presented themselves individually and others formed Joint Temporary Ventures. This process continued with the final selection of 13 candidates.
- During the next stage, the procurement body evaluated the documents received from the various bidders and invited a maximum of six candidates – the ones with the highest scores – to take part in a dialogue stage.
- This was followed by the opening of the development stage, an interaction with candidates to determine and establish the most suitable solution or solutions to meet the needs of the procurement body.
- Once these stages were completed, the procurement body called on the candidates to submit their final tenders, based on the specific solution or solutions presented during the dialogue stage. The candidates presented their tenders, which were evaluated under the initially established contract-awarding criteria, ending with the proposed contract award in April 2015.

3.3 The rise of PCP

As is described in Table 2 above, PCP is designed to steer the development of solutions towards concrete public sector needs. In order to do so, PCP occurs through a number of phases that focus on R&D activities, and it involves different suppliers competing through different phases of development. In other words, the evaluation and selection process runs at the same time as testing and prototyping, while also keeping a continuous check on technical and economic feasibility, possible alternative solutions and interoperability requirements.

In spite of the fact that, among the SCC solutions analysed in this study, PCP was not used as much as the other PPI models, on the basis of a literature review, it appears that it is one of the models increasingly adopted by municipal authorities when procuring SCC solutions. Although not frequently adopted at the time of its design, this situation is changing especially due to a push from the EC, which has been concentrating efforts around PCP issues and investing considerable resources to encourage the use of PCP in Europe. As a result, **PCP has now become quite a popular procurement tool, although the process that needs to be followed by public procurers is not so simple.**

FP7 projects fostering PCP

ENIGMA is a FP7 project that aims to implement a joint transnational PCP procedure in the field of public lighting. Coordinated by the city of Eindhoven, the project's partner municipalities (Eindhoven, Malmö, Stavanger, Espoo and Bassano del Grappa) cooperate on procuring innovation and testing in a real life environment the technologies that their commercial subcontractors develop. Through a learning platform, ENIGMA encourages city-to-city learning and exchanges on PCP methodologies and public lighting innovation.

Other interesting examples include: **P4ITS** (a network focusing on developing PCP solutions for innovative ITS and services); **Smart@Fire** (procurement of innovative fire fighting equipment, aimed at reducing risks and better handling city emergencies); **V-CON** (procurement of a virtual modelling road infrastructure solution).

PCP is applied when market consultation activities indicate that there is currently no solution to the city needs. It is a process that has been developed for the procurement of R&D services rather than for the acquisition of actual goods and services. Since R&D services for new technologically demanding solutions, such as those for SC, require considerable funding, **PCP necessarily requires collaboration with authorities and bundling of demand**. When PCP is used, it means that a very high level of technical knowledge and understanding of the issues concerned, as well as substantial funding, are in the hands of the public authority.

A clear advantage of such a model is that, by leaving a clear separation between the pre-commercial R&D phase and the roll-out of commercial end-products resulting from the R&D, it enables public purchasers to filter out technological R&D risks before committing to procuring a full-blown innovative solution for large-scale commercial roll-outs. Importantly, any follow-up procurement of commercial volumes of end-products most likely requires a **competitive tendering procedure** in accordance with the EU Procurement Directives. The **Klimastrasse** case illustrates how PCP was carried out outside the FP7 framework.

PCP outside the FP7 framework

Klimastrasse, Cologne, Germany

The Klimastrasse project focuses on the development of sustainable streets and neighbourhoods and it concentrates on several areas, including: optimized building insulation, renewable energy, innovative use of electricity, intelligent energy management for the home, etc.

The project procurement was conceived as a PCP. The key market consultation instrument was held in September 2012, in the form of a workshop with regional industry and local companies. The project co-ordinator RheinEnergie drafted an invitation list out of a "business directory" with Cologne and long-time RheinEnergie partners in other projects (e.g. Bayer, Siemens, Alstom). During the workshop, the project coordinator illustrated expectations of the Klimastrasse programme and the main goals, and received concrete suggestions from stakeholders. In the preliminary market consultation preceding the project phase, the bookstore Blücherstraße installed energy saving lighting, which resulted in power savings of 67% per month. In this case, it has been estimated that the investment in retrofitting will have paid for itself in three to four years.

Also in relation to PCP, one of its recent innovative features involves the possible **inclusion of a living lab⁸ methodology in the final stage of the process**. This can help to support the success of the operation, testing and applying the product to real life before entering the market.⁹ The **ALCOTRA** case study below illustrates the integration between a living lab methodology and the PCP model.

PCP within the cross-border cooperation programme ALCOTRA

In the context a cross-border cooperation programme between Italy and France (ALCOTRA), the **Regional Authority of Valle d'Aosta** published two PCPs for the acquisition of services relating to energy and mobility. Both envisaged a living lab methodology at the end of the process.

After having mapped the regional economic system, the Regional Authority identified two technology platforms around smart energy and smart mobility topics. Through the **consultation of public bodies and local stakeholders**, the needs and expectations of the community as a whole were identified. Subsequently, a call for ideas on possible innovative solutions to the problems and needs identified during the consultation was launched to attract the interest of local enterprises and research institutions.

As a result of the tender, the Regional Authority of Valle d'Aosta signed contracts in the thematic domains of:

- Smart energy, energy storage systems, monitoring, control and management of energy consumption and energy production and intelligent management of service networks (e.g. monitoring systems and remote management of energy consumption in public schools);
- Smart mobility, road network monitoring through sensors to detect environmental conditions, innovative systems for the payment of parking integrated with information on local public transport (e.g. MobinVallée experimental App), management systems and vehicle sharing.

The prototypes developed by the companies were tested from June 2013 to October 2013 in two living labs (e.g. MobInVallée and Applus Energie) by the local community (municipalities, mountain communities) and by public entities (foundations, universities, high schools) and were distributed both in the Valle d'Aosta Region and in the wider cross-border area.

⁸ Living labs are tools for co-design based on open innovation, active end-user involvement, application of research to real-life and control over the environmental, economic and social impact of the product.

⁹ The insertion of the living labs within the pre-commercial procurement had also some critical aspects: financial constraints linked to the program rules didn't allowed to invest in the project; some difficulties were found for the remuneration of the participants; language constraints limited the expression and the involvement of the stakeholders; some problems were recorded in relation to intellectual property rights of the participants.

3.4 Adoption of the traditional procurement model

However, not all cases adopted PPI models. The example below illustrates how a traditional procurement model was adopted for the development of the **Valencia SC Platform**. Based on the exchange with stakeholders, it appears that **the traditional model is best when the will of the city's authority as well as the objectives of the SCC solution are clear.**

The open tender procedure adopted for the Valencia SC Platform

The Valencia SC Platform (VLCi Platform) enables the city to centralize information on municipal services thanks to the use of a technological solution. The Platform compiles key indicators of city management and urban services and it aims to improve and rationalize the governance model and encourage greater participation by civil society, organizations and companies in municipal service provision.

In November 2013, the ICT Service of Valencia City Council opened a public tender for the development of an **integrated City Platform**. Out of the seven companies that presented their proposal, **Telefonica I+D** obtained the best score in the evaluation process and in July 2014, it won the public tender.

Given the requirements of the tender, which envisaged an "open" platform based on recognised standards, **the winning proposal was based on the European open standard Fi-Ware** (a public-private collaboration initiated in 2011 between the European Commission and major European ICT companies, with the aim to define a Platform as an open option for the development and global deployment of applications on the Future of Internet).

Some other relevant characteristics of the tender include:

- The platform selected is based on open-standards, making it fully interoperable with other systems and enabling the municipal administration to avoid the phenomenon of lock-in;
- The municipal administration envisaged an "exist strategy" for the platform, training the public personnel as an additional way to avoid the lock-in;
- For the development of the platform, the city's administration was able to drain some budget components from other municipal departments, avoiding extra costs for the solution but creating efficiencies through channelling SC budget items from various municipal departments into one;
- The inclusion of a Service Level Agreement (SLA) in the vertical contracts of the city administration, in order to provide data to the platform.

Telefonica I+D and the City Council established a four-year contract for the development of the platform with a budget amounting to c. € 4.8 million. The contract established the collaboration of Telefonica and the City Council to integrate the "VLCi Platform" into the internal city structure and systems. In addition, the contract defines **the obligation of the private company to transfer the technological solutions to municipal staff according to a training plan approved by the Municipality.**

4. Conclusions and recommendations

4.1 Conclusions

The complexity of cities, in terms of both stakeholders involved and processes, including procurement, represents one of the main barriers towards the adoption of SC solutions. This complexity emerges in many areas (policy, regulatory, governance, economic and organizational) of local governments and may create difficulties for city leaders and stakeholders to agree on the methodologies for implementing SC solutions. From the analysis carried out, it appears that **a crucial factor able to accelerate the deployment of SCC solutions is an open and collaborative market**, which is able to bring into it the greatest number of SC solutions, which – as a direct consequence – assures lower implementation costs. Procurement, specifically **procurement of innovation, is a factor able to ensure such open and collaborative market**.

The analysis made in this study reveals that SCC solutions are typically procured using procurement of innovation models, as “traditional” procurement models have been adopted only by 3% of cases (cf. Figure 2 above). Moreover, from the analysis it also appears that apart from the innovation partnership, which has been the most adopted model, other innovative procurement models have been adopted by public authorities in a more or less equal manner.

4.2 Recommendations

Drawing from the literature review¹⁰, as well as from the case studies analysed, the following set of recommendations has been developed. The intent is for these recommendations to support stakeholders in the procurement of SCC solutions, creating up-to-date knowledge of the best ones and avoiding situations where procurement frameworks inhibit innovation.

In each case, the stakeholder group most relevant for the recommendation (i.e. either the EC or National Authorities or City Authorities) has been identified.

Recommendation 1

Foster the exchange of best practices among Member States (MS) and city authorities, also creating synergies between platforms.

Mainly relevant to the EC.

As PPI models have recently been introduced and as SCC solutions are still innovative for some municipal authorities, the EC should map each SCC solution that adopted a PPI model, in view of fostering the exchange of best practices (including templates adopted for bids) among MS and city authorities, and so as to ensure that the procurement models and practices that proved to work best are shared and known among practitioners. A specific focus should also be placed on **how to make better use of standards in public procurement in order to resolve ICT lock-in**.

¹⁰ Please refer to the bibliography in chapter 5.

Moreover, as there are activities already exist in the fields of innovation procurement and standardization¹¹, the creation of synergies rather than of new initiatives, could be considered.

Recommendation 2

Continue to develop user-friendly guidelines concerning SCs, as well as templates and standard text to facilitate procurement.

Mainly relevant to the EC and National Authorities.

Also in terms of fostering the exchange of best practices and supporting the dissemination of knowledge, the EC should keep investing in developing guidelines for the effective take-up of SCC solutions. Guidelines should be practical, including examples showing how suggestions could be translated into reality.

To procure SC solutions it may be necessary to use specific documentation, which may be time-consuming to produce and that not all public authorities (especially those with less experience) may be able to develop. Therefore, the EC and national governments could **develop templates and standard texts on the basis of good practices**. Compiling the relevant documentation referring to government-produced texts and templates is valuable as it grants a higher level of protection through contractual clauses, thereby minimizing disagreements risks.

Recommendation 3

Assess standards and specifications.

Mainly relevant to the EC.

The European Commission should assess standards and specifications in order to **make sure that selected standards and specifications foster interoperability and reduce lock-in**. This is currently organised on a national basis (e.g. within the context of MSs' National Interoperability Frameworks); however, there has been an effort at a European level to adopt a common framework that fosters collaboration between MS.¹²

It would be useful not only to map all standards available in the field of SC, and develop new ones when necessary, but to promote an awareness campaign towards the procurers to inform them on the use of platforms based on open standards and full interoperability.

¹¹ For example, the Innovation Procurement initiatives around Europe and the Public Procurement of Innovation Platform.

¹² In this regard, CAMSS is an EC initiative launched under the ISA programme, aiming to promote the collaboration of MS in defining a Common Assessment Method for Standards and Specifications (CAMSS). CAMSS does not select standards. Rather, it is a method to assess standards and specifications, which is based on the best practices of several Member States and aligned with the European Regulation on Standardization.

Recommendation 4

Develop procurement and supplier management strategies.

Mainly relevant to City Authorities.

Municipal authorities should develop procurement and supplier management strategies that enable rather than block their vision for more citizen-centric and integrated service delivery.¹³ Also, when developing integrated solutions requiring a certain degree of interfacing with several contractors, municipal authorities **should consider designing Service Level Agreement (SLA) that clarify how contractors interact with one another.**

Recommendation 5

Align contracting principles with an IT architecture fitting to smart cities and create an integrated view of city procurement requirements.

Mainly relevant to City Authorities.

When reviewing city procurement policies in view of limiting vendor lock-in, municipal authorities should align contracting principles with service-oriented, open and city-wide IT architecture.

Also, municipal authorities should take an integrated view of the city's procurement requirements. This could entail **establishing governance arrangements enabling a citywide view of major procurements** by the city council and other major public sector organizations operating in the city.

Recommendation 6

Review procurement policies to ensure they are aligned with SC contracting principles.

Mainly relevant to City Authorities.

Municipal authorities should review procurement policies to ensure they are aligned with SC contracting principles, namely:

- **Build open data into all procurements**, be clear that all data is to be owned by the city and not the supplier, or establish clear requirements for the supplier to make data available via open standards and fair, reasonable and non-discriminatory terms;

¹³ BSI Standards Publication (2014) Smart city framework – Guide to establishing strategies for smart cities and communities.

- **Incentivize innovation and collaboration**, ensure that contractual arrangements encourage collaboration with others to create new value, and the sharing of common city assets;
- **Avoid supplier lock-in**, by integrating interoperability requirements into all ICT procurement, using commercial off-the-shelf products and open standards wherever possible, and factoring in the costs of exit from the outset.

Recommendation 7

Work to cultivate an innovation ecosystem across the city and among its suppliers.

Mainly relevant to City Authorities.

Municipal authorities should cultivate an innovation ecosystem across the city and among its suppliers, including:

- **Publishing the city's procurement policies**, ensuring that changes following reviews are known;
- **Publishing and updating a pipeline of major city procurement opportunities**, to allow enterprises to plan in advance;
- **Involving suppliers** in the definition of products, respecting transparent procedures and ultimately enhancing competitiveness.

4.3 Operational guidelines

Finally, Table 3 on the following page presents a set of more operational guidelines that may be useful also as a checklist for those procuring SCC solutions. These guidelines are grouped by procurement phase.

Table 3: Guidelines for each step of a typical procurement process for City Authorities

	Guidelines
Tendering preparation	<ul style="list-style-type: none"> ▪ Treat the procurement process as a specific project and not as a purely financial and administrative task; align it with broader policy objectives (e.g. health, environment, transport), indicating clear objectives, a clear work plan, tasks, timeframes and responsibilities, and allocated resources. ▪ Ensure high-level support, also in terms of technical, legal and management skills within the project team following the tendering process. ▪ Involve and consult end-users at different stages of the process, in order to identify real needs and to ensure that a given solution is successfully adopted.
Early market engagement	<ul style="list-style-type: none"> ▪ Consult the market before tendering (e.g. through a technical dialogue), respecting company confidentiality and ensuring transparency, in order to identify what is available on the market and to involve it in the city's strategic processes, vision and future city priorities. Accordingly, it is advisable to document all information given during a meeting with a company and ensure equal treatment of others. ▪ Give the market sufficient warning, to ensure better responses from companies (who need time to develop new solutions). ▪ Create an updated library of innovative technical solutions, including evaluation costs and benefits, in order to make the market research phase easier.
Tendering and contracting	<ul style="list-style-type: none"> ▪ Consider the full-life cycle costs of the product; in other words, do not only consider the purchase price of the product but also the cost of operation (e.g. energy and water consumption), maintenance, and final disposal. ▪ Make the tender SME-friendly, as many innovative solutions may come from smaller, more creative companies; accordingly, consider splitting tenders into lots or encouraging consortia to bid, in order to make volumes manageable. ▪ Promote centralized or collaborative public procurement between cities for a number of Public Authorities, if needed using the service of intermediate experts (e.g. regional agencies, experts hired ad-hoc for a tendering process, etc.), to take advantage of knowledge and synergies from different public authorities that have similar needs. ▪ Reduce the duration of a framework contract when it is focused on a specific technology. ▪ Focus on the service provided and not on the technology used. In this regard, longer contracts could help the provider to introduce newer and more efficient solutions. ▪ Be clear about how to evaluate proposals against a tender's award criteria, ensuring a fair comparison of bids so as not to disadvantage the most innovative proposals.

	Guidelines
Monitoring and evaluation	<ul style="list-style-type: none">▪ Monitor the performance, both in economic terms and with respect to resource consumption, to identify deviations and apply, if necessary, the damages or penalties foreseen in the contract.▪ Communicate the achievements and promote greater engagement with other city authorities to understand what has worked well and foster closer collaboration.

Source: Our elaboration based on BSI Standards Publication (2014) Smart city framework – Guide to establishing strategies for smart cities and communities.

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Annex I. Overview of procurement models available for SCC solutions

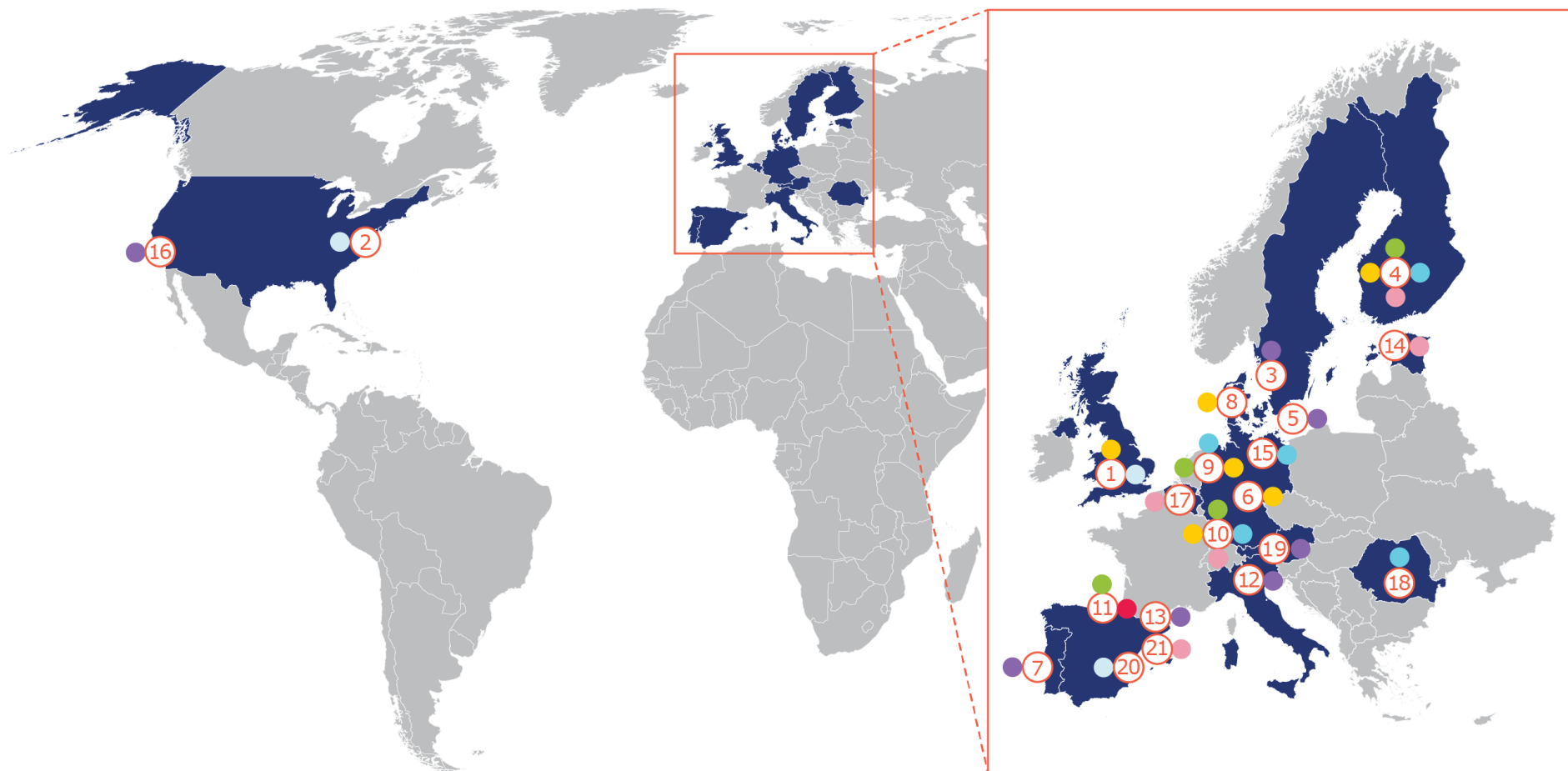
Solution	City	Total investment (EUR)	Procurement model						No procurement
			Preliminary market consultation	Pre-commercial procurement	Competitive dialogue	Competitive dialogue with negotiation	Innovation partnership	Open procedure	
(1) 3e houses	Bristol	1,999,391					x	x	
(2) Bigbelly	Philadelphia	1,980,140						x	
(3) Celsius	Gothenburg	26,000,000							x
(4) Eco2	Tampere	350	x	x	x		x		
(5) EcoGrid	Bornholm	21,000,000							x
(6) E-Energy case	Mannheim	5,500,000					x		
(7) Energy for Schools	Lisbon	n.a.							x
(8) Intelligent Traffic Solution	Copenhagen	n.a.					x		
(9) Klimastrasse	Cologne	1,700,000	x	x			x		

Solution	City	Total investment (EUR)	Procurement model						No procurement
			Preliminary market consultation	Pre-commercial procurement	Competitive dialogue	Competitive dialogue with negotiation	Innovation partnership	Open procedure	
(10) MeRegio	Baden Wurttemberg	21,000,000	x		x	x	x		
(11) New fleet management system	San Sebastian	227,400	x			x			
(12) Open Move	Trento	-							x
(13) Smart Street	Sant Cugat	-							x
(14) Smart Ticketing	Tallinn	2,000,000			x				
(15) smartPORT logistics	Hamburg	n.a.					x		
(16) Streetline	Los Angeles	n.a.							x
(17) Sustainable Blue Gate	Antwerp	37,800,000			x				
(18) Tram upgrading	Craiova	-					x		

Solution	City	Total investment (EUR)	Procurement model						No procurement
			Preliminary market consultation	Pre-commercial procurement	Competitive dialogue	Competitive dialogue with negotiation	Innovation partnership	Open procedure	
(19) Vienna Citizens' Solar Power Plant	Vienna	20,000,000							x
(20) Valencia SC Platform	Valencia	4,800,000						x	
(21) Barcelona urban platform	Barcelona	-			x				
Total	-	-	4	2	5	2	8	3	7

Source: Our elaboration.

Annex II. Map of procurement models available for SCC solutions



Procurement model key

- | | |
|---|--------------------------|
| ● Preliminary market consultation | ● Innovation partnership |
| ● Pre-commercial procurement | ● Open procedure |
| ● Competitive dialogue | ● No procurement |
| ● Competitive dialogue with negotiation | |

City/Case study key

- | | | |
|--|---|---|
| 1. Bristol, UK
3e houses | 8. Copenhagen, DK
Intelligent Traffic Solution | 15. Hamburg, DE
SmartPORT Logistics |
| 2. Philadelphia, US
Bigbelly | 9. Cologne, DE
Klimastrasse | 16. Los Angeles, US
Streetline |
| 3. Gothenburg, SE
Celsius | 10. Baden Württemberg, DE
MeRegio | 17. Antwerp, BE
Sustainable Blue Gate |
| 4. Tampere, FI
Eco2 | 11. San Sebastian, ES
New fleet management system | 18. Craiova, RO
Tram upgrading |
| 5. Bornholm, DK
Eco Grid | 12. Trento, IT
Open Move | 19. Vienna, AT
Vienna Citizens' Solar Power Plant |
| 6. Mannheim, DE
E-Energy Case | 13. Sant Cugat, ES
Smart Street | 20. Valencia, ES
Valencia SC Platform |
| 7. Lisbon, PT
Energy for Schools | 14. Tallinn, EE
Smart Ticketing | 21. Barcelona, ES
Barcelona Urban Platform |