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SHARINGCITIES

EIP-SCC
European Innovation Partnership
on Smart Cities and Communities

Smart lamp post management framework

Component-based design

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Summary

This document is written for cities. To provide a practical guide through the complete step-wise process of evaluating then implementing a smart lamppost solution. One where the city can exploit its existing lighting assets; upgrade them to low energy luminaires; and add 'smart' features at the same time (WiFi, environmental monitoring, eVehicle charging and the like).

It is an open deliverable that works alongside a number of other referenced documents (e.g. the DIN spec) and is intended for broad use by EU cities; and in time will be offered to the international Standards Development Organisations for adoption/adaption and publication.

Contents

1.   Introduction

This section sets out the readership and purpose of the document; summarises what we mean by smart lampposts; discusses activities at a European scale; tables the principles that underpin this component-based approach; and introduces the (current) dozen or so elements of the "Smart Lamppost Toolkit".

1.1   Intended readership

This report is written by and for the Sharing Cities lead cities; and intended for 'fellow' Sharing Cities, any other city that may wish to upgrade their lighting stock and install smart services.

The target reader may have a variety of functional backgrounds, however will likely be the person who holds, or may hold responsibility to implement smart lampposts.

As this is written for use beyond the Sharing Cities programme we limit the reference to the programme. More about Sharing Cities can however be found at **www.sharingcitites.eu**.

1.2   Purpose

The purpose of this report is to provide a practical 'how to' guide – a 'toolkit' – for cities that seek to implement smart lampposts. The document will: amongst cities – common approach, common design, potentially joint buying: brings better deals.

The additional cost for 'smart' features is also modest in the context of an overall LED upgrade programme. And for the more progressive cities, the additional smart services open up scope to consider novel financing and business models, as well as potential new revenue opportunities.

- **Help** ready cities for swifter action
- **Provide** greater confidence within cities
- **Provide** a common basis that supports collaboration between cities
- Potentially **stimulate demand** aggregation, which can lead to better market value (notably for smaller cities that cannot bring scale to the market)
- **Exploit** what already exists – adopt or adapt; only create anew where necessary

1.3   Definition of smart lamp post

Pragmatically, we assume smart lamppost systems are those that:

- Retain, serve and indeed enhance the principal compliant obligations of street lighting (way-finding, public safety)
- Use low-emission luminaires
- Are connected as a network, enabling system-wide controllability (e.g. central mgmt. system), and integration of smart services

- Include within the network a number of additional smart services (sensors and the like) that extend services beyond just the provision of light
- Arguably, have 24x7 power to enable continuous smart services

Thus, a "smart lamppost", with its various services, will most likely be mixed within a larger portfolio of existing 'traditional' lampposts (that have been upgraded to low emission (LED) lighting.

1.4 The smart lamppost opportunity at a European scale

As context for this document, we provide a summary of the opportunity for smart lamppost implementation across Europe.

The EIP-SCC (European Innovation Partnership for Smart Cities & Communities) https://eu-smartcities.eu/about seeks to bring together cities, industry, investors and others to accelerate uptake at scale of smart city solutions through active managed collaboration. 5,000 organisations made commitments to the cause at launch in 2013. There are a dozen significant initiatives within the 6 action clusters that frame the programme. The 'Humble Lamppost' is one of the more developed initiatives, and seeks to upgrade 10 million street lights across EU cities. The initiative is considered an obvious 'quick win' for smart cities, and the significant goal has attracted the attention of senior politicians, financiers, and other stakeholders. The case for action is strong, as can be seen in figure 1. The logic being that the economic motive to upgrade for energy savings stimulates action to also capture the various other 'smart' service opportunities that are discussed further in this report.

In addition to the EIP-SCC initiative, there are now 9 Horizon 2020 "Smart City Lighthouse" programmes in action across Europe that involve ~50 lead cities. These provide an ideal and incentivised grouping of target cities to support uptake of such an initiative.

The percentage of luminaires across EU that have been upgraded to LED is low – single digit percentage. This is however increasing rapidly as the attractive savings / RoI and market confidence in the technical solutions becomes apparent.

The supply market is also increasingly active – also on the smart services standpoint – as the potential to multi-purpose lampposts becomes more apparent.

This suggests that the time to act is now. And if EU industry does act swiftly (led of course by the actions of cities), there are clear economic opportunities, both within Europe and in the rest of the world.

60-90m	Estimated nos. of streetlights across Europe
75%	Percentage of streetlights over 25 years old
20-50%	Proportion of city's energy bill from streetlights
€3bn	Approx. annual street lighting energy cost
50-75%	Energy saving potential through LED
€1.9bn	Annual energy saving from LED
2.6mn	GHG equivilent on removing #cars from EU roads

Benefits

- Efficiencies
- Speed to value
- Image
- Confidence

Society
- Better experience
- Safer society
- Pride in community
- Lower taxes?

Cities

Industry
- Reduced sales cost
- New market
- Revenue/profit
- Brand
- Export potential

EIP-SCC goal is to upgrade 10 million lamp posts in EU cities through...

Developing a component-based common solution that can scale
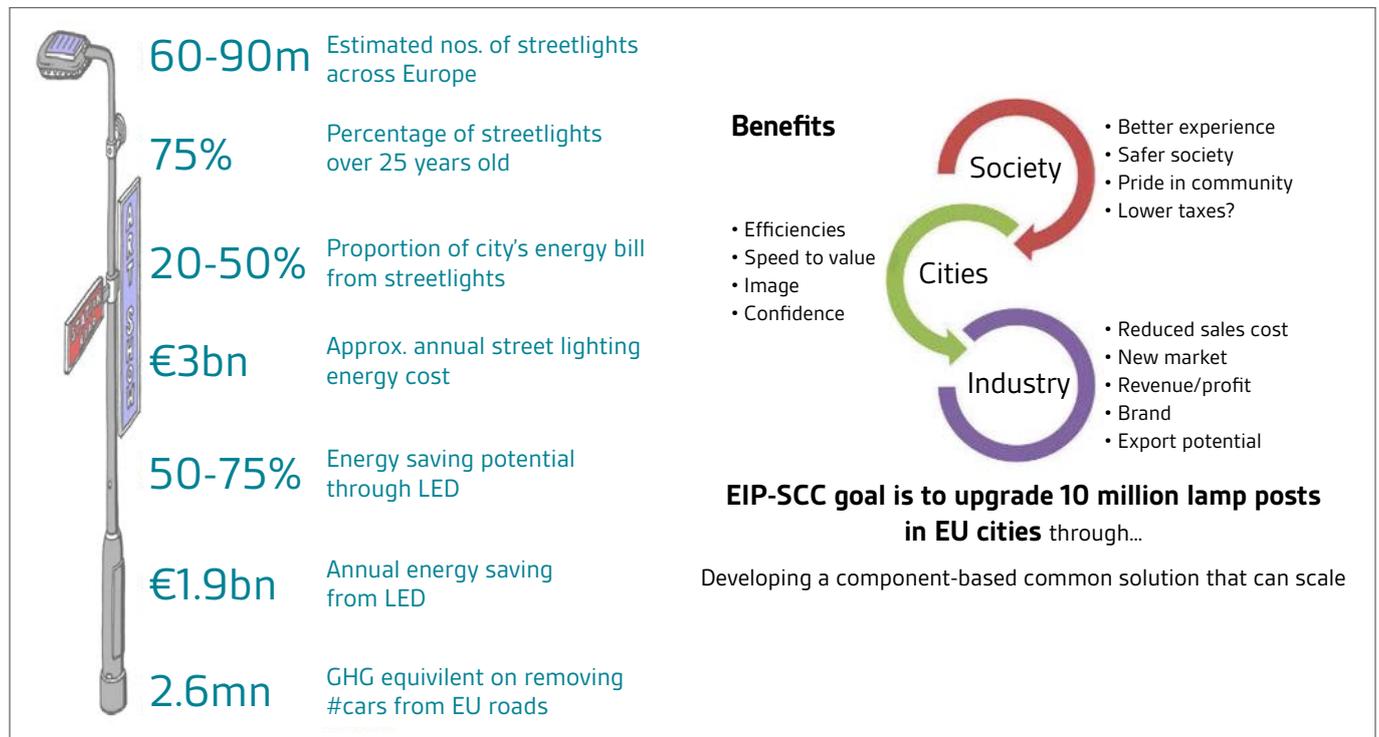
Figure 1: The EIP-SCC "Humble Lamppost" Initiaitve case for action

1.5 Principles that underpin this component-based approach

Ten principles set the foundation by which cities will maximize value from this approach:

1 **City-needs-led** approach, that ensures a clear demand signal forged by the use cases and user needs of the city

2 **Component-based** core design, that enables common solutions to be scaled and replicated

3 **'Building blocks'** that support local selection and solution tailoring to city-specific user needs

4 **Adaptable** to cities of different size, and stage of development (notably smaller cities)

5 A **'digital first' approach** that seeks to maximize value from multi-functional technologies and city data

6 **Integrated, open solutions** that prevent vendor lock-in, and enable rapid capture as standards

7 **Early engagement in the project value chain**, to capture opportunities for innovation and support acceleration of adoption

8 **Multi-disciplinary perspective** to help cross the various sectors and 'silos' in cities

9 **Deployed at scale**, through demand aggregation and joint acquisition, application of common requirements, or consistent replication activities

10 Incorporation of EU and worldwide **leading practices.**

These principles are addressed in the approach that follows.

1.6 Introducing the 'humble lamp post' toolkit

The 'Toolkit' will provide support for cities in their endeavours to accelerate towards scale collaborative implementation in a number of areas throughout the value chain. These tools will naturally develop and be added to over time. This document should therefore be seen as an initial 'version 1' toolkit. The longer-term plans are to move this towards (international) standards bodies.

The toolkit has been structured in five groups (A-E), as shown in figure 2, and elaborated below:

A. Considering current state and what / where the opportunities lie

1. Maturity / Development Model
2. HL Asset Landscaping
3. Use Case Templates

B. Engaging the relevant stakeholders and aligning to city priorities

4. Stakeholder Management
5. (BSI) Leadership Guide & Mgmt Framework

C. Technical Detailing

6. Market Research & Analysis
7. Detailed Specification
8. Technical "Bill of Materials"

D. Finance & Procurement

9. Business Case
10. Business Models & Financing
11. Procurement / Commissioning Templates

E. Operation, Monitoring & Sharing

12. Operational Savings Metrics / KPIs
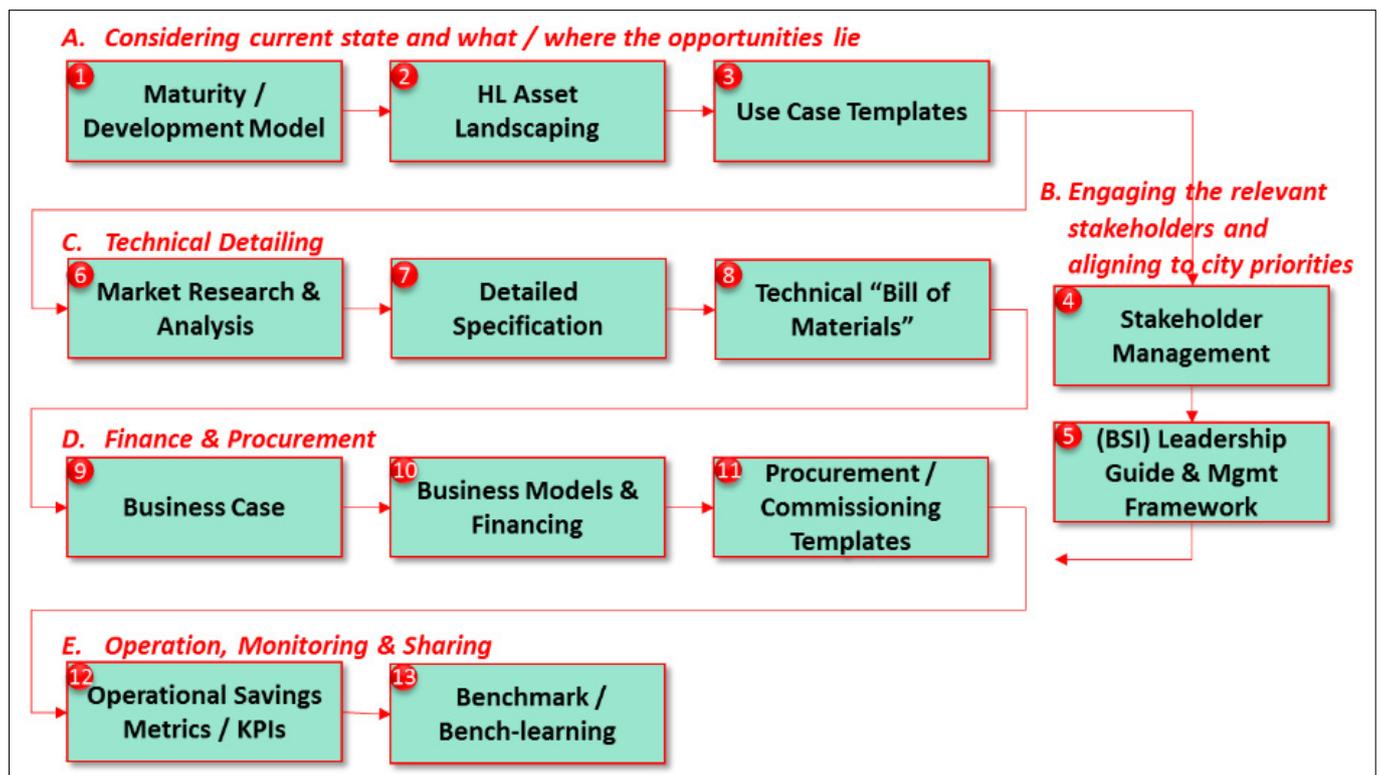13. Benchmark / Bench-learning

Figure 2: Humble lamp post implementation toolkit

A. Considering current state and what / where the opportunities lie

1. **Maturity / Development Model** – this is a 5-step common frame of reference that can be used to capture current state, and desired ambition, against a set of interdependent themes.

2. **HL Asset Landscaping** – this is an important step in the process to capture the current and planned smart lighting assets. The current process tends to be city specific. There are emerging tools that can help streamline the process.

3. **Use Case Templates** (incl DIN Spec) – these provide a description in very tangible terms for the user value that occurs from implementation of smart services. Here we make explicit links to the new DIN PAS 91437 "imHLa - integrated multi-functional Humble Lamppost".

B. Engaging the relevant stakeholders and aligning to city priorities

4. **Stakeholder Management** – implementing smart lighting solutions, particularly if done at scale. The recognition of who is engaged and measures to ensure sufficient will support the initiative at the right point in time is vitally important. There are tools that can help this process.

5. **Leadership Guide & Management Framework** – advising and convincing political and professional city leaders to make decisions to implement smart lighting is important and non-trivial. As is the task of supporting the management of the various sectors (public and private) that will own and manage the resulting services. Materials to support this are in development and the intention is to formalise these through the (BSI) standards process. This will complement the DIN materials.

C. Technical detailing

6. **Market Research & Analysis** the market for the various elements of the smart lamppost differs significantly across Europe, so a local assessment is typically warranted (if one is not available from an analyst or fellow city). For some components of the solution information will be relevant and available that are internationally applicable (e.g. luminaires); however, for other elements (e.g. like lighting columns, or sensor solutions) that may be available locally it is important to assess the local market.

7. **Detailed Specifications** – many standards exist that provide technical detail for street lighting. And plans may well be in place to update existing or develop more, in addition to the noted DIN and BSI activities. Few/none of the more than 300 potentially relevant standards screened are: international; deal with aspects of finance and performance; or discuss smart services. However, several will be relevant. We seek to identify which documents cities could/should use.

8. **Technical "Bill of Materials"** – in order to implement a modern smart lamppost system the city must develop a comprehensive listing (bill of materials) for their intended new system.

D. Financing and procurement

9. **Business Case** – the financial and non-financial value from upgrading to LED and implementing smart services; and the associated uncertainties and risks, require the development of a more comprehensive justification. Tools to support this that provide confidence and consistency are thus essential to help accelerate collaborative implementation.

10. **Business Model & Financing** – ownership and operational accountability for lighting and smart services associated with lampposts can involve various actors. Options can be developed; choices must be made around this important theme as it can set boundaries of possibilities into the future. Public budgets are under strain, so in many circumstances cities may need incentives to move at scale (beyond a solid business case / RoI). Financing sources and options are explored – also in relation to business case and business models.

11. **Procurement / Commissioning Templates** – speeding and guiding cities through the acquisition process is vitally important. The toolkit captures some of the basic frameworks and content that cities can use to aid this process. Here we recognise that nation states and cities may well have local policies and practices that play a major shaping role in this. And we recognise that the European Commission is seeking to streamline regulation and processes to enable cross-EU procurements to become more commonplace.

E. Operation, monitoring and sharing

12. **Operational savings metrics / KPIs** – post implementation proof of value becomes that much more crucial when different value and potentially revenue streams emerge from a smart lighting installation. And when different investors may be involved (notably non-public). As such, the ability to pragmatically and accurately (rather than perhaps precisely) evidence financial and non-financial value – including the different temporal stages where value emerges – is something that is essential for cities to demonstrate.

13. **Benchmark / bench-learning** –as cities move further into operations of smart lamppost systems there will clearly be a growing desire and opportunity for shared learning to: build market confidence for those cities that have not acted, and more generally for industry; drive further innovation, seek opportunities for further improvements, and the like.

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BSI Group Headquarters
389 Chiswick High Road
London W4 4AL
United Kingdom

T; +44 (0)345 086 9001