

BUILDING SMART CITIES TOGETHER

# SHARINGCITIES



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# Deliverable 3.10

# Potential Smart Lamppost Fast-Track Standard

Partner: A2A Smart City

Potential Smart Lamppost Fast-Track Standard		WP3 – Task 3.4 – D3.10	
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## LIST OF ABBREVIATIONS AND ACRONYMS

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SC	Sharing Cities
DIN	Deutsches Institut für Normung
IPWEA	Institute of Public Works Engineering Australasia
EIP-SCC	European Innovation Partnership on Smart Cities and Communities
HL	Humble Lamppost
EC	European Commission
WP	Work Package
BSI	British Standards Institution
BoM	Bill of Materials
RBG	Royal Borough of Greenwich
Tech Std	Technical Standard
LG	Leadership Guide
MF	Management Framework
TS	Technical Standard
IMHLa	Integrated Multifunctional Humble Lamppost
CMS	Content Management System

## 1 EXECUTIVE SUMMARY

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Standardisation organisations have recognised that a traditional approach to publishing technical standards that relate to smart solutions and systems has limited effectiveness given the cross-cutting nature of the technologies involved. Therefore, this deliverable report seeks to outline the suite of reference documents that have been created in relation to the 'Humble Lamppost' in line with a broader vision around standardisation. In doing so this helps to highlight the further work needed to ensure that appropriate support for cities is in place to enable them to further implement or upgrade smart lighting, and to promote associated market shaping activities.

Sharing Cities (SC) has previously produced, under Deliverable 3.9, a high-level leadership guide for city leaders to support early decision making and help them to direct the work of officers. Alongside this is a management framework designed to help city officers time-compress pre-procurement activities and ensure consistency. Both the leadership guide and management framework have been incorporated into the British Standards Institution (BSI) portfolio, with the latter also aligned to the new Deutsches Institut für Normung (DIN) standard.

Two other key documents have also been produced in recent years that support these activities. The German Institute for Standardization / DIN has produced a series of non-light related use cases and is already aligned with the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) Humble Lamppost (HL) initiative. The Institute of Public Works Engineering Australasia (IPWEA) has also produced a model specification around LED lighting and lighting controls, however, these do not refer specifically to 'smart' services.

Numerous other related documents have also been produced to support cities and market uptake of smart lampposts, which this deliverable sets out, but what is clear from this work is that a coherent portfolio of standards and tools is now needed to ensure progress. The European Commission (EC) has now indicated the need for SCC01 programmes, i.e. a group of projects related to EIP-SCC, to collectively develop a common standards strategy. This deliverable presents a useful contribution towards that goal.

## 2 INTRODUCTION

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*This section provides further context on the HL and proposes a three-tier structure for the standardisation documentation that should be developed around smart technology.*

### 2.1 HUMBLE LAMPPOSTS AND STANDARDISATION

The number of street lights in Europe is estimated to be between 60 and 90 million with 75% of them estimated to be more than 25 years old. A single digit percentage of these have been upgraded to LED despite LED offering more than 50% energy and operations savings, accompanied by a relatively short payback period.

The goal set by the EIP-SCC programmes in 2014 was to upgrade 10 million smart lampposts across EU cities. This was to be achieved by developing a common component-based solution that can be tailored to local needs with smart add-ons as well as the creation of scale through demand aggregation and the building of investor interest and confidence helped by a strong case for the Return on Investment potential of LED. This initiative was championed initially by Dutch politician Anne-Marie Jorritsma, and has continued to gain the interest of several Commissioners and other senior and influential people. The case for upgrading HL is considered to be well established and understood and offers clear financial returns and other potential forms of value.

In general, standards provide useful guidelines for those working to implement new technologies. This is particularly true for complex systems, such as smart lampposts, given the number of components involved and potential global volumes. Standards span an important spectrum of needs from (i) providing a foundation for innovation; to (ii) capturing best practices from in-field experience; to (iii) establishing a basis for (regulatory) compliance. Standards can help build a much clearer understanding of the cities' needs, and thus increase confidence within cities to accelerate decision making and inform implementation in order to deliver projects faster, and with more consistency and certainty. They also provide an important basis to guide industry on matching these needs.

International Standards Organisation (ISO) recognised in a 2015 Strategic Advisory Group internal publication the need to 'write to their audiences', particularly for the cities market where city staff were not natural users of standards. As a result a recommendation was made to develop three-tiers of document:

- Leadership Guides to inform city politicians;
- Management Frameworks to bring together the various functions and disciplines that are involved in cross-cutting smart city developments; and
- Technical Standards that form the more traditional portfolio of materials published to date that buyers specify against and inform build to.

The former two tiers are new, and emerging. British Standards Institution (BSI) in particular has adopted this approach for the cities market.

The development of high quality standardisation documents relies in part on input from those involved in the implementation of this technology. The SC programme aims to provide such useful input with the additional value of testing of smart lampposts taking place in such diverse cities. SC

will, working with national and international standards organisations, capture the direct experience of partners that are working on this topic as the programme progresses and contribute to the development of a “fast-track” standard, i.e. a basis for the creation of official standards which can be shared with the cities, not only in Europe, but all over the world.

## 2.2 HUMBLE LAMPPOSTS AND SHARING CITIES

Within SC, implementation of smart lampposts represents a specific task (Work Package 3.4, WP3.4) and the main areas of work include:

- More efficient energy consumption through LED lamps
- Providing infrastructure for network implementation (Wi-Fi, Lora, mesh, etc.)
- Additional elements such as water level/flood, image sensing, sound recognition
- Infrastructure for other services including digital signage, push-to-talk, etc.

An important factor in the installation or upgrading of smart lampposts is that they will provide important infrastructure for other tasks within the programme. One example is in electric vehicles, where the smart lampposts can act as a charging point, avoiding duplication elsewhere.

The diagram below provides a summary of the potential components that can make up a truly smart lamppost.

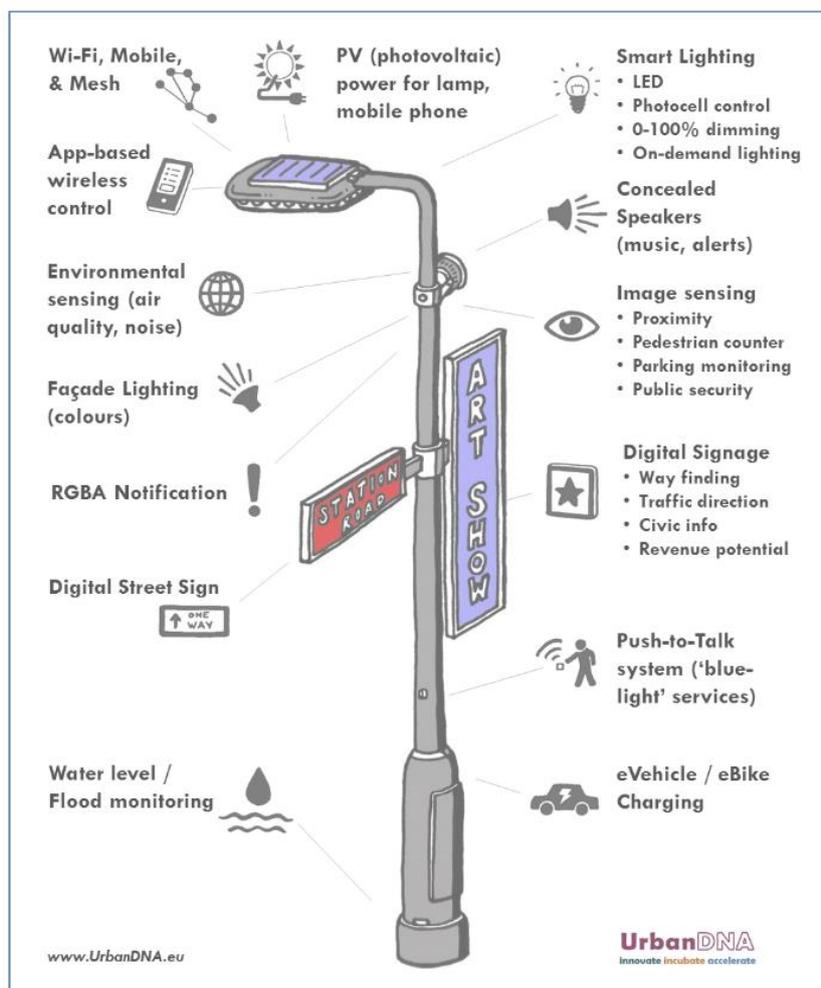


Figure 1: HL Potential Use Cases

### 3 WORKING TOWARDS A COMMON APPROACH

#### 3.1 PROGRESS TO DATE AND EXISTING DOCUMENTATION

As highlighted earlier in this deliverable, standardisation organisations have recognised that a traditional approach to publishing technical standards that relate to smart solutions and systems has limited effectiveness given the cross-cutting nature of the technologies involved and the limited familiarity with traditional standards within cities. Historically some standards have also focussed on the views of industry rather than being city-needs-led and have tended to focus on inputs not outcomes. They often leave cities without the knowledge or capabilities to determine their own requirements.

Therefore, this deliverable seeks to outline the status of reference documents that have been created in relation to the HL in line with a broader vision around standardisation. In doing so this helps to highlight the further work needed to ensure that appropriate support for cities is in place to enable them to further implement or upgrade smart lighting, and to promote associated market shaping activities.

Below is the list of documents to support market uptake of smart lampposts. It summarises a variety of relevant documents, some of which are non-SC documents, that all form an important part of the overall portfolio of what is required to support both demand side and supply side for this relatively new cross-cutting smart lamppost:

Document	Content	Audience	Stage of document development	Notes
Leadership Guide (Sharing Cities, EIP-SCC, 2017)	Short (6 page) key issue document to support early decision making of city leaders, and help them direct work of officers	City Leaders	Complete	Presently being pulled into British Standards Institution (BSI) portfolio and branded as such for sustainability; and in future to International Organization for Standardization (ISO)
Management Framework (Sharing Cities, EIP-SCC, 2017)	Longer (60 page) document to help city officers time-compress pre-procurement activities and ensure consistency	City Officers	Complete	Being adopted by BSI (as above), and aligned to new DIN standard
Bill of Materials (BoM)	SC table that captures suppliers and technical details for elements of	City Technicians	TBD	Instigated by RBG, and partially captured across cities. A potentially

Supplier Listing	the solution			helpful basis for other cities – warrants more work
Procurement Templates	Model templates (and example documents) for cities to use	City Procurement / Technicians	TBD	No specific plans or commitments are in place within SC. However, Australian (below) documents help, and Technical Assistance grant is being sought to produce for EU market
Tech Std (IPWEA, 2017) (IPWEA, 2017)	2 Australian docs capture lighting spec/template	Industry	Published	Better explained in Section 2.3.
Technical Standard (DIN, 2017)	A new DIN non-light (12) Use Case standard developed by DIN, aligned with EIP-SCC HL initiative	Industry	DE issued	English version presently in translation
Standards List	A summary of the applicable standards that should be used for the measure	City Officers Industry	TBD	A worldwide list of 370 standards was developed by BSI, and provides a basis to unpick most appropriate docs
Demand Aggregation Case Studies	Current state capture of 4 interdependent cases addressing governance, decision making, technology, business models, procurement, finance & funding	Cities / Broader Market	1 <sup>st</sup> version complete	Based on SC & EIP HL initiative, principally reported in the deliverable D3.12. (Sharing Cities, EIP-SCC, 2017)
Market Case Studies	Ongoing capture of evidenced value & technical cases to boost market uptake			Anticipated to be supported via other SCC01s and EIP-SCC

In the table the “status” column refers to this meaning:

- *complete*: the document has already been developed at its definitive version
- *TBD*: document to be defined/written
- *published*: the document has already been published and is publicly available
- *issued*: the document has been approved and released by the related authority

For sake of completeness, it should be noted that market uptake cannot be achieved via documentation alone. In addition to the above there are a number of other actions in place to support broad uptake. These include, for example:

- **Demand side city survey** – to get a pan-EU picture of status, needs, plans, issues, potential, to then use to mobilise cities to collaborate and aggregate demand
- **Communications** – work with EIP-SCC and market journals to raise general awareness via articles etc
- **Match-making / Pavilion Event** – very focused market engagement process and event to build awareness and understanding, and stimulate the market (cities, industry, investors) into scale action
- **City-Cluster Activities** – gain commitment to collaborate on common approach from a few significant sized cities to then access grant/loan finance to steer early proof of concept action in the market

### 3.2 MOTIVATION FOR A 3 TIER STRUCTURE

Usually traditional standard documents are structured with the aim to provide all the technical details for the implementation of a specific technology. These documents require an elevated technical knowledge to be understood and appreciated; in other words, they are addressed to people working in technical fields. In many cases, this deep level of details brings as a consequence a lack on an overall view of the solution.

Moreover, people involved on the technical implementation are not the ones having the decisional power to choose among all the possible solutions and how to achieve high level objectives. On the contrary, people having this power, such as city leads, would face many issues in understanding a technical standard and would not find any value in it. Instead, this kind of readers would need documents including motivations and evidences for choosing a particular technology and what could be the actual qualitative benefits and efforts coming from this choice; technical details are not required and can be left to technical operators.

### 3.3 DESCRIPTION OF PROPOSED 3 TIER STRUCTURE AROUND STANDARDISATION

It is clear from the information above that there is a need to coordinate and aggregate the data and learning from these various activities and documents in order to enable further progress and take up by cities around the world. In terms of the documentation specifically, we propose that some of these are key in forming the basis of an official standard. These are:

- **Leadership Guide (LG)**
- **Management Framework (MF)**
- **Technical Standards (TS)**

A more detailed description of each document is reported in the next section.

#### 3.3.1 LEADERSHIP GUIDE

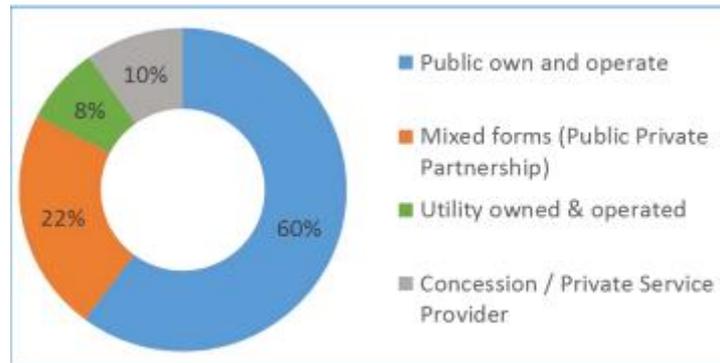
Sharing Cities has previously produced, under Deliverable 3.9, a high-level leadership guide for city leaders to support early decision making and help them to direct the work of officers. This has been incorporated into the BSI portfolio, and is aimed in general at politicians, city leaders and those involved in decisions related to the city administration and management.

This document is referenced in *‘Exploiting the “Humble Lamppost” – a kick start to smart city’* (Sharing Cities, EIP-SCC, 2017) developed in the context of the SC programme.

The main purpose of this document is to help:

- Explore new ‘smart’ potential from (existing) lamppost assets
- Identify a variety of related solutions
- Highlight the value case
- Introduce the MF
- Suggest 7-steps for leaders to drive forward progress

After reading this document, those involved in city management will have a broad understanding of the advantages around implementation of smart lamppost infrastructure. It also provides an introduction around the related business models.



*Figure 2: Anticipated Business Model (EU Average)*

As an example, in Figure 2 are reported the average percentages of sectors involved in business models for the HL in EU. Such chart underlines the fact that public sector is involved in 80% of business models; this information can be very useful for decisions in the context of city management.

### 3.3.2 MANAGEMENT FRAMEWORK

Alongside the Leadership Guide is a management framework designed to help city officers time-compress pre-procurement activities and ensure consistency. Both the leadership guide and management framework have been incorporated into the BSI portfolio, with the management framework also aligned to the new DIN standard (see below).

The current document is addressed to readers with a functional background with responsibility for implementing smart lampposts. This framework is addressed to all cities that may wish to upgrade their lighting stock and install smart services.

Relative to the humble lamppost, the reference document is entitled ‘*Smart Lamppost Component-Based Design Management Framework*’ (Sharing Cities, EIP-SCC, 2017) developed in the context of the SC programme.

In particular the document is intended to:

- 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

Together, the Leadership Guide and Management Framework help accelerate cities to be ready to implement faster and better.

### 3.3.3 TECHNICAL STANDARD

Two other key documents have also been produced in recent years that support these activities. The German Institute for Standardization / DIN has produced a series of non-light related use cases and is already aligned with the EIP-SCC Humble Lamppost initiative (which in itself has been developed in close cooperation between the EIP-SCC and Sharing Cities). The Institute of IPWEA has also produced a model specification around LED lighting and lighting controls, however, these do not refer specifically to ‘smart’ services. Likewise, the EIP-SCC and Sharing Cities is collaborating with the authors of the latter document to align activities for the benefit of the market.

***DIN 91347 Integrated Multifunctional Humble Lamppost (ImHLA) – Design Specification*** (DIN, 2017)

A 56-page technical specification addressing non-light smart functions including dimming, traffic, Wi-Fi, connectivity, environment, electrical vehicle charge, drone, energy storage, security, signage – based on open design, detailing architecture e interoperability requests.

***IPWEA (ANZ) Model Specification – LED Public Lighting + Lighting Controls*** (IPWEA, 2017)  
(IPWEA, 2017)

Two model tender specification (27 and 61 pages) developed by public- private collaboration, for LED and Lighting Controls (Content Management System, CMS).

These latter two documents together can provide the basis by which cities’ can capture their needs in sufficiently robust a manner to specify to the supply market. The first describes non-light use cases. The second captures technical detail for smart lighting: i.e. including technical specification for modern LED luminaires, and for the central management system (CMS) that optimises lighting levels and thus energy savings.

It is anticipated that by working in collaboration between Sharing Cities, the other SCC01s, the EIP-SCC, and (inter-)national Standards Bodies we will be able to efficiently and effectively migrate these documents towards a portfolio of useful documents to support the market.

## 4 CONCLUSIONS AND RECOMMENDATIONS

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We presented an overview of the documentation involved in the definition of a standard document related to the smart lamppost solution for the cities. We structured the documentation in three complementary parts, the first one being more high-level and addressed to city leads (Leadership Guide), the second one (Management Framework) presenting a more detailed description of the technical solution but still having an overall view on the whole thing, while the third element is represented by a collection of actual Technical Standards related to specification and implementation.

A number of other related documents have also been produced to support cities and market uptake of smart lampposts, which this deliverable sets out, but what is clear from this work is that a coherent portfolio of standards and tools is now needed to ensure progress. In the context of the SCC01 programmes, the EC has now indicated the need for SCC01 programmes to collectively develop a common standards strategy. This deliverable presents a useful contribution towards that goal.

The lack of demonstrators in real urban settings, capturing the real learning from the implementation of the Smart Lampposts in a systematic way, has led to difficulties in establishing clear rules that allow the standardisation of the concept. Due to this, cities are insufficiently confident to implement the measure at scale. The demonstrators that are being provided by Sharing Cities aim to address this gap, by contributing to the delivery of concrete solutions, offering value to cities and/or districts, and demonstrating business models for implementation and investment. In addition, and having standardization as a primary goal, synergies are being created at several levels, including with other SCC01 Smart Cities Lighthouse Programmes, EIP-SCC HL Initiative, all of which we are working in collaboration with.

In many ways what we have described is a journey that will take time (traditional standards development is measured in years). In terms of forward plans, the following is envisaged to support this roadmap:

1. Test of the Leadership Guide and Management Framework by Sharing Cities and other SCC01s
2. Update of the Management Framework in particular to include further tools, templates and practices
3. Capture of the current BSI-logo documents as PASs (fast track standards); and / or submission (via BSI) to international standards bodies to develop more formal standards
4. Work with EC / EIP-SCC to agree the strategy for and input of SCC01s to the development of standards, and their increased adoption
5. Continued alignment between market practitioners, DIN, BSI, EC, & ISO to develop a portfolio of documents on the smart lamppost
6. Capture of case studies to build confidence in the market

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