SHARINGCITIES

Smart booklet

Smart lamppost

Kick start your smart city journey

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LIST OF ACRONYMS

CMS	Central Management System
EV	Electric Vehicle
LED	Light Emitting Diodes
LoRaWAN	Long Range Wide-Area Network

April 2020

This booklet was prepared through the collective knowledge from Sharing Cities and building on the experience of the wider context of the SCC01 Lighthouse programmes involving 17 projects, 116 cities and hundreds of partners. More information about the Lighthouse programmes can be found here.

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LIGHTHOUSE CITY KEY

	Lisbon
	Royal Borough of Greenwich, London
	Milan

THE VALUE OF IMPLEMENTING SMART LAMPPOSTS

WHAT?

A smart lamppost is a lamppost that uses Light Emitting Diodes (LED) and that also includes applications such as WiFi, air quality and parking sensors, video cameras for public security, and electric vehicle (EV) charging. They can also be used by telecom operators as existing infrastructure for next generation mobile networks. The well-proven lighting and maintenance savings of the smart lamppost offer an attractive bankable initiative. The smart lamppost also presents a proven and visible 'quick win' for smart cities, and involves relatively mature de-risked technologies.

WHY?

Lampposts typically constitute a considerable network of existing assets: there are between 60 and 90 million lampposts across Europe. Since 75% of them are more than 25 years old, they represent a real opportunity for European cities to realise substantial savings through collaboration.[1] Data from smart lampposts also helps cities optimise other services.

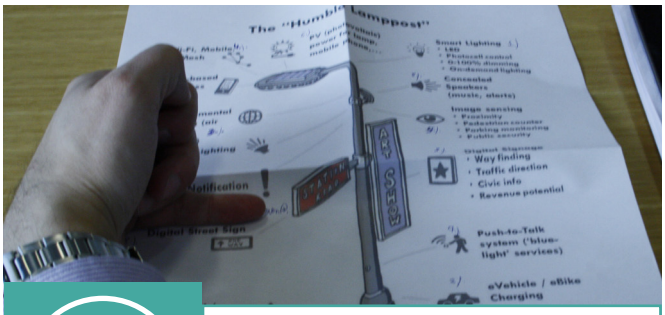
Smart lampposts also offer a range of other benefits for people and the environment, such as public safety, reducing carbon emissions and pollution, lowering congestion and fostering a sense of place.

A simple upgrade to LED can already save between **50%** and **70%** of energy costs and maintenance costs – that's roughly **€2 billion savings** annually at an EU-wide level.

Energy saving

Smarter infrastructure

FINANCIAL VALUE



ENVIRONMENTAL VALUE

Light pollution reduction

Reduction of carbon emissions

Expanding the EV charging point network (one of the conditions to be met in order to incentivise EVs)

SOCIAL VALUE

District attractiveness and liveability

Safety, reduction of crime

ECONOMIC VALUE

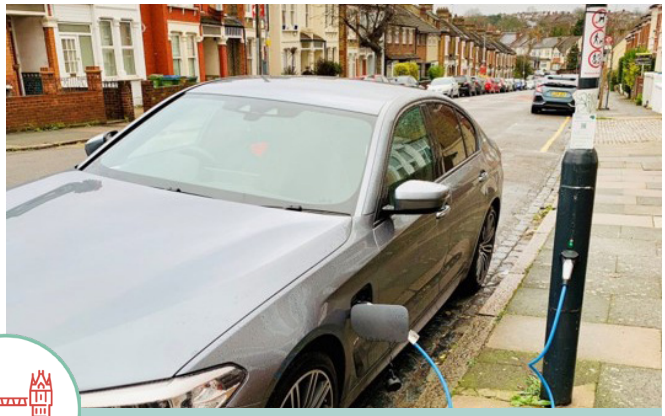
Better urban planning thanks to sensors

A lamppost can serve more than a dozen functions beyond just light, from public safety, to connectivity, and can hold sensors or electric charging points.

1. Source: EIP-SCC, Humble Lamppost Survey Insight Paper, 2017

SHARING CITIES SOLUTIONS

Here are three examples of how cities in the Sharing Cities project are using this technology. These different use cases all respond to local conditions and consider financial (revenues, savings), environmental (air quality, reduced CO_2), social (health, safety) and economic (local business development) values.



The Royal Borough of Greenwich has upgraded some lampposts to LED lighting, and equipped some with a Central Management System (CMS) to gather a wide range of data. Some of the lampposts also have EV charging points in their poles and provide connectivity for smart parking sensors.

Two CMS systems have been trialled. The first is a mesh networked system where data is communicated back via a central node, whereas in the second system data is communicated back from each individual column via a SIM card.

Over 400 LED installations have been delivered during Sharing Cities, with 50 also receiving CMS, as well as 13 lampposts with communications units for smart parking sensors and 26 with EV charging capability.

In addition to the LED upgrade of all its lampposts, Milan has implemented a Long Range Wide-Area Network (LoRaWAN) for the lampposts to communicate with other internet connected applications and share data. The city also equipped the lampposts with environmental devices to better monitor flows of information such as noise level, air quality and traffic levels.

The current scope of the project is at a district level. However, the ambitions is to roll out across the city and the region and to replicate beyond the region.

The number of lampposts in Milan, at city level, is currently around 136,000.

Lisbon has retrofitted and upgraded 7,500 lampposts to LED. The city is implementing a LoRaWAN network infrastructure to allow lampposts to communicate with internet connected applications over long range wireless connections. The lampposts will also have environmental sensors to monitor air quality, temperature and humidity, and a few have been equipped with smart parking sensors.

DO LAMPPOSTS RESPOND TO MY NEEDS?

Your local context, including legislation and cultural conditions, affects the kind of lamppost that is ideal for your city, and the adjustments to the standard model that you may have to make. Here is a brief overview of key factors you will have to consider when planning your approach.

In Greewich, Lisbon and Milan the lampposts are owned by the municipality. Consequently, political leadership is vital to support the deployment of smart lampposts. The local politicians need to be engaged formally to move opportunities forward.

Political leadership
Governance
Smart city & data strategy
Citizen engagement
Legal and regulatory

POLITICS, POLICY & REGULATION

In Burgas, a fellow city from Sharing Cities, where summers can be swelteringly hot, lamppost temperature and humidity sensors trigger an automatic misting system that keeps pedestrians cool and activates a watering system for the hanging flower baskets.

Climate
Assets and infrastructure
Natural assets
Geography

CITY 'PHYSIOLOGY'

SOCIAL & CULTURAL CONDITIONS

Security
Lifestyles
Demography
Cultural heritage

In Lisbon, obtaining permission to connect external equipment to old lampposts is challenging, due to legal and certification issues. The city is exploring alternatives and defining procedures to ensure progress.

ECONOMIC PERFORMANCE

Market readiness
Technology
Performance
Investment
Appetite for risk and innovation
Entrepreneur ecosystem

London's more open regulation, access to finance, and smart city maturity offers a conducive environment to implement smart lampposts.

TECHNICAL OPTIONS

Smart lampposts follow the principle of an open interoperable component-based design. This delivers flexibility and choice for cities in selecting solutions to suit their community needs. You can build something standard with given instructions, but also have the option to adjust and adapt the pieces to suit your needs. The smart lamppost has been broken down into five main components as a basic common taxonomy. Each tends to have rather different market dynamics (e.g. maturity, supply chains).

These are the five key components, and some things to keep in mind when considering each one:

The pole

- Do you need a new replacement? A pole more than 25 years old is high in maintenance costs
- Wind loadings might be an important concern if you are planning to add new fixtures to old columns
- Pole manufactures are usually local

Light

- Think about the placement of LED lighting. It improves safety for driving, walking and cycling. It creates a more attractive environment even during dark hours; however, it might also contribute to disrupting the sleep cycle in residential areas
- Dimming lights can be an attractive financial solution; however, consider the potential effect on community safety

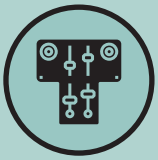
Smart fittings

- Consider how to plug in the smart applications with 24 hour power supply, battery backup or solar power
- Ownership of these assets is recommended as they might generate public value
- The suppliers are typically regional SMEs or start-ups

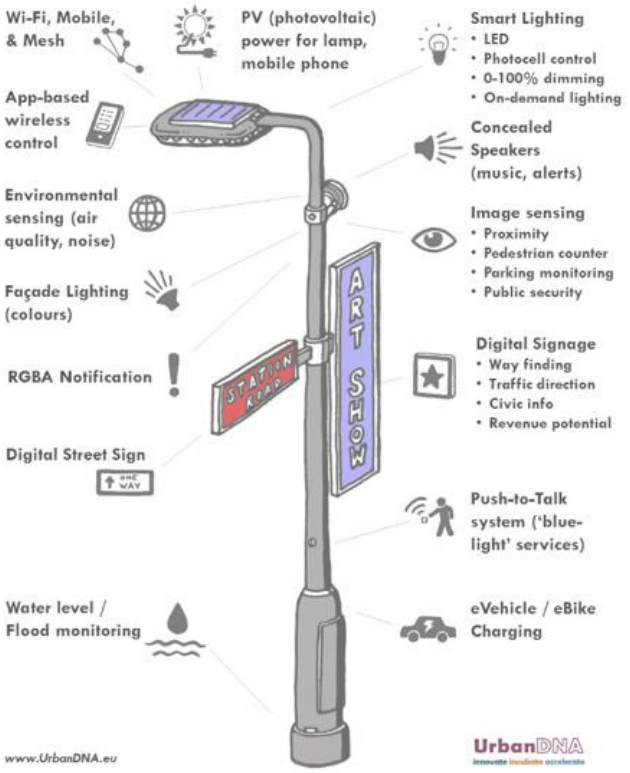
Electrical system

- Should the system provide power to one or a group of street lights? Different scenarios are possible according to the district typology
- The power voltage is usually a country specific standard
- The market is very mature with international and national suppliers
- Ensure that your current and future billing system can shift from conventional lighting services to smart features
- If your system does not have a 24 hour power supply an alternative may be needed to support smart features during the daytime

Control system



- Provide a full management control of the light system in case of specific circumstances (e.g. accidents that require full light levels)
- The control system is usually part of a broad control platform monitoring various assets in the city e.g. urban sharing platform



MARKET SITUATION

Smart lamppost solutions are proven in the market. Yet, there is still a substantial number of pilots and small-scale projects in play. Cities are not buying at the optimal volumes to achieve the best value, though they offer an attractive target to the market.

BUDGET TO EXPECT FOR A PILOT PROJECT

€12,000 (pilot project consisting of two environmental sensors and LoRaWAN connectivity for data transmission). Sensors can cost between €400 – €3,500+ per device, depending on the quality and the types of measurements they provide. Service costs also vary.

COST IN CITIES FOR THE IMPLEMENTATION

Milan and Lisbon both benefitted from €120,000 thanks to Sharing Cities, while Greenwich combined grants from Sharing Cities with other European funding and the funding opportunity of other sister projects to trial smart features.

20 lampposts have been used in Milan for the installation of smart devices through the Sharing Cities project.

ASSET OWNERSHIP

Greenwich

Greenwich Council owns its lamppost stock. Most of the stock that is on the highway and some key routes in London are owned and managed by Transport for London. There is an existing contractual arrangement for the management and maintenance of the stock. When new land development occurs, new columns can be installed. In that case, after the lampposts on the council highways are funded and installed, they are handed over to the city council.

Lisbon

The lampposts are owned by the municipality and the operations are contracted to a private operator, EDP-D.

Milan

The maintenance of the assets is managed by A2A, a company which is 50% privately and 50% publicly owned. The city of Milan runs the lighting assets and A2A runs the network of sensors and wireless devices.

COMMON CHALLENGES AND RECOMMENDATIONS

OVERCOME CITY GOVERNMENT SILOS

The rigid vertical structures of many city governments can act as a barrier to implementing integrated solutions.

Greenwich and Milan created a 'Smart city department' to deal with the collaborative nature of smart solutions. It helps to engage city leaders and nominate certain staff as pathfinders.

INVOLVE ALL STAKEHOLDERS

One of the major challenges for implementation is the decision making, which involves technological, financial and aesthetic points of view, as well as positioning of sensors, choice of models, and how to make sensors fit the budget.

Milan has managed the decision making process by conducting a joint technical and economic study and holding regular meetings between the partners involved.

ENSURE CYBER SECURITY

While the added solutions provide many useful services and often improve daily life for citizens, their digital and connected nature makes them a potential target for malicious online attacks.

Cities should ensure that digital and data solutions are protected with the use of cyber security platforms or solutions.

ORGANISE CO DESIGN PROCESSES

With increasing numbers of data collection devices such as sensors and cameras being deployed across cities, privacy is becoming a high priority topic for many citizens.

Involve citizens in the co-design of smart solutions dealing with data. This can be done with a citizen engagement platform or other engagement tools.

ORGANISE JOINT PROCUREMENT

There is a lack of proven business cases for some smart applications such as advertising, noise sensors and traffic monitoring.

Join forces with other cities, especially in your own country or region.

HAVE A CROSS-DEPARTMENT EXPERT

Through the addition of multiple solutions to smart lighting infrastructure, there is a real possibility that systems will become overwhelmingly complex. A lack of integrated standards, mismatched interfaces and multiple proprietary systems exacerbate this.

Cities should nominate pathfinders, people with sufficient expertise on the topics at stake who work in a cross-cutting way to ensure collaboration across departments towards agreed goals.

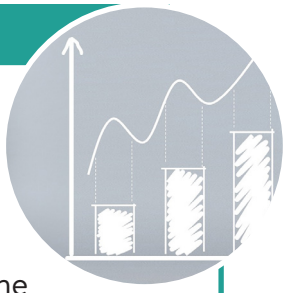
HAVE A LONG-TERM VISION

Smart lighting infrastructure is likely to be in operation for at least 20 years, therefore the embedded systems need to be adaptable over long periods of time and need to be able to support new applications.

Long-term vision requires political support and the interoperability of measures and devices implemented. It is also important to avoid any vendor lock-in, i.e. getting stuck, due to technical constraints, with your initial supplier.

COLLECTION OF VALUABLE DATA

The return on investment can take up to 2-3 years, which can be considered quite long.



The newly equipped lampposts will not only engender savings over the years, but will also allow the collection of valuable data which can eventually lead to the optimisation of other city services and the reduction of their costs.

About Sharing Cities

Sharing Cities is a project to improve the lives of citizens across Europe, testing smart solutions for cleaner, more efficient cities. New systems for urban energy management, building retrofit, e-mobility and smart lampposts, will cut carbon emissions in cities as well as making everyday life more affordable, comfortable and convenient for residents, both at home and on the streets. Sharing Cities tests and evaluates these smart city solutions together with citizens and creates channels to make them more affordable and better tailored to cities' needs by fostering international collaboration between cities and the private sector.

Additional information on Sharing Cities can be found on the website: http://www.sharingcities.eu

More information

Additional information and guidance about other smart cities projects can be found on the Smart Cities Information System's website: https://smartcities-infosystem.eu/solutionbooklets

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