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Smart Cities Marketplace

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SMART LIGHTING IN CITIES

FACTSHEET

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Introduction

All cities have infrastructure networks providing their citizens with energy, communication, transport, public lighting and other services. When these ageing infrastructures are replaced or updated, it is often done independently from each other, even though there is a large and untapped potential in integrating and advancing these networks. Modern technology could allow this integration, offering safer city environments, better connectivity and more services to cities and their citizens.

The public lighting infrastructure is particularly well placed to take up the role of a connectivity platform that offers not only smart lighting but also a series of other functions and benefits to cities. Omnipresent in cities, lampposts have a great potential for standardisation and could integrate various sensors, telecommunication technologies necessary in smart cities, as well as offer access to charging.

General information

What is the 'big picture'?

Currently, cities spend 20+% of their energy bills on lighting, while 75% of public lighting assets in the EU are more than 25 years old and mostly use inefficient lamps. Many cities are already upgrading their lighting infrastructure to energy-efficient Light Emitting Diodes (LEDs), some advanced to smart lighting with dimming and safety-supporting controls. Additionally, there are examples of cities that use their lampposts for other applications, such as air quality monitoring, Wi-Fi provision, video surveillance for public security, and electric vehicle (EV) charging.

A smart, connected lighting system is part of a local, wireless, decentralized network with local or cloud-based intelligence. Data is collected from sensors on the lampposts, being cameras, daylight, movements or noise detection, and processed to derive optimal energy-efficient and safety-supporting operation of the public lighting. The additional energy savings of smart connected lighting compared to LED lighting are at least 60% higher, ensuring a sound return on investment.

Turning this highly distributed infrastructure into a connectivity platform could further facilitate the provision of services that can help address current and future environmental, mobility, energy, and security challenges – as well as providing additional services and value streams.

What are the pros and cons compared with regular solutions and how does it contribute to overall sustainability and clean energy goals?

Smart connected lighting provides on average more lighting hours, but with dimmed power, optimally adjusting the local momentaneous need and the preferences of the citizen for the specific place and time. More lighting hours now come with lower overall energy demand and a longer lifetime of the LED lamps. Automated fault detection further reduces downtown and discomfort. The energy consumption can additionally be measured more accurately, ensuring that the city pays the correct price. Energy-saving of 50-70% is possible while using such smart connected lighting. Considering that around 360 million street lights are projected to exist on the

globe by 2029, and that only a quarter of them currently uses LED lamps[1], the energy-savings globally could be significant.

The investment in this new infrastructure is substantial and best done at least at streets of neighbourhood level. However, the energy saving potential of smart connected lighting makes it a transition model, attractive for ESCOs and enabling cities with limited investment capacities to realise this transition.

Compared to the smart connected public lighting infrastructure, an integrated infrastructure in the form of lampposts could incorporate additional functions, as shown here:

Smart Lighting: LED, photocell control, 0-100% dimming, on demand lighting.

PV: solar power for lamp.

APP-BASED: wireless control.

Wi-Fi: mobile & mesh.

Concealed speakers: music, alerts.

Image sensing: proximity, pedestrian counter, parking monitoring, public security.

Digital signage: way finding, traffic direction, civic info, revenue potential.

Digital street sign.

Push-to-talk system: 'blue light' services.

EV / E-bike charging.

Water level and flood monitoring.

Environmental sensing: air quality, noise.

RGBA notification.

Façade lighting.

1 A quarter of streetlights could be smart by 2030 - Cities Today - Connecting the world's urban leaders (cities-today.com)

Compared to the smart, connected lighting, the lampposts could provide additional services, including offering a (potentially free) public Wi-Fi network, providing the powered foundations for a mesh network of (IoT) sensors across the city, helping drivers find a parking place, improving public safety, supporting environmental monitoring (air quality, waste, flooding, noise). They could be a place for electronic street signage, public information and advertising (revenue), the home of sensors that helps to direct visually impaired people, a powered web of electric vehicles (cars, bikes) charging points, or even pedestrian-flow monitors that could help to keep the high street a vibrant place. Looking more to the future, they could show how connected and automated vehicles could move in a streamlined and safe fashion around a city."[2]

What is the role of the city and how can the city support it?

A good start for any city is to engage city leaders and decision-makers around through smartification or even multi-purposing these assets, to undertake a swift and pragmatic baseline analysis, and finally, to consider what use cases/new services would be most valuable in particular districts.

Several experts on public lighting could guide cities, distribute grid operators on possibilities, costs and benefits of smart connected lighting. ESCOs and financing institutions have sampled the experience by supporting a city of its choices.

The more advanced 'humble lamppost' is being packaged as an ongoing initiative to help to guide city officers through the process of stakeholder engagement, making the case, implementation, and operations, thus they could move with confidence. Also, a potential collaboration with other cities could aggregate demand and strike a better deal with the market.

City Hall plays a vital role in 'convening' public value from this infrastructure, therefore it should be centralised to the evaluation of what and how things should be done, even though they may not undertake the work or operate the asset.

Although cities must lead the action, regional and national governments play an important role in addressing regulatory blockers, stimulating and facilitating demand aggregation, helping to access appropriate financing and funding models and the like.

2 Exploiting the 'humble lamp post'—a kick start to smart city. A guide for city leaders, BSI Group, 2017

Societal & User aspects

For citizens, a safer and cleaner city certainly offers advantages. Increased functionalities through better connectivity and/or integration of, e.g. 5G, further adds to that. These benefits could also be delivered whilst managing potential privacy and surveillance issues by cities taking an active role in ensuring that appropriate data protocols are in place.

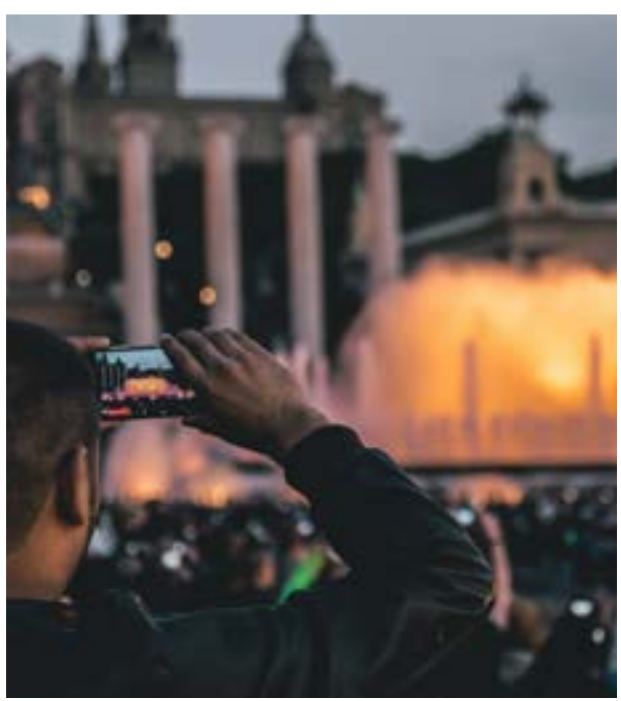
An upgrade to LED lighting certainly provides substantial energy and operational costs savings – thus it is a better use of people's taxes. In addition, cities could benefit from all the extra services and values previously noted.

Furthermore, the smart lamppost could help with COVID-19 Response and Recovery by, for instance, managing crowds (CCTV), informing the public (signage), and encouraging people to safely step back onto the streets – this offers economic and mental health benefits.

The image of a city using such smart technology would also generally improve, attracting more visitors and investments. The delivered benefits of sensible applications of monitoring could be shown to outweigh the additional costs of powering and maintaining the infrastructure to provide a wider set of services.

There are various technological challenges to overcome, however, the biggest challenge is getting the attention of decision-makers and aligning across the various functions (silos) to make the case and act on it.

The solutions are all out in the market, and the industry is ready to support them.



Regulations and policies

There are no relevant barriers to smart connected lighting. Moving to an integrated lamppost-model, there are few major regulatory or policy barriers, however, across Europe, there can be a number of regulatory, policy (and technical) challenges that have to be overcomed on topics like provision of 24-hour power, the ability of cities to sell power (e.g. eV charging points on poles, privacy policy and the usage of data, and the structural integrity of poles to take the additional equipment.

Finance

There is a range of models in place from traditional city ownership and operation through to concessions for lighting and smart services. Cities must consider different business models, financing and funding options to ensure that they chart a course that is most appropriate for them.

A growing number of countries are seeing the integrated lamppost technology as mature and bankable, and putting more expectations on cities to self-finance (or attract market funds), thus saving public funds for riskier or policy investments.

There are clear opportunities for significant double-digit savings through accessing economies of scale through collaboration amongst, particularly the smaller, municipalities. A few cities buy at a scale even closer to the optimal scale.

As it has been noted in a recent white paper: "*A solid return on investment can be secured by updating lampposts. More and more cities have started adopting energy-efficient LED street lighting which offers substantial savings on energy consumption. There is a significant opportunity for a range of sensors to be added, to exploit the smart lamppost to save energy, and, at the same time, implement additional 'smart' services and help build a 'smart city'. Examples include LA, Copenhagen and Barcelona*"[3].

A smart lamppost can capture a wide range of new forms of data. Cities are encouraged to consider this valuable new asset carefully, and not trade away the potential from this without careful consideration. (The same need exists, of course, for many other smart city solutions). Executed wisely, however, this new data could be an important source of potential value.

3 Shining a Global Light—The role of the 'Humble Lamppost' in a post-Covid green digital recovery, Higginson Strategy, 2021

Barriers

People-related:

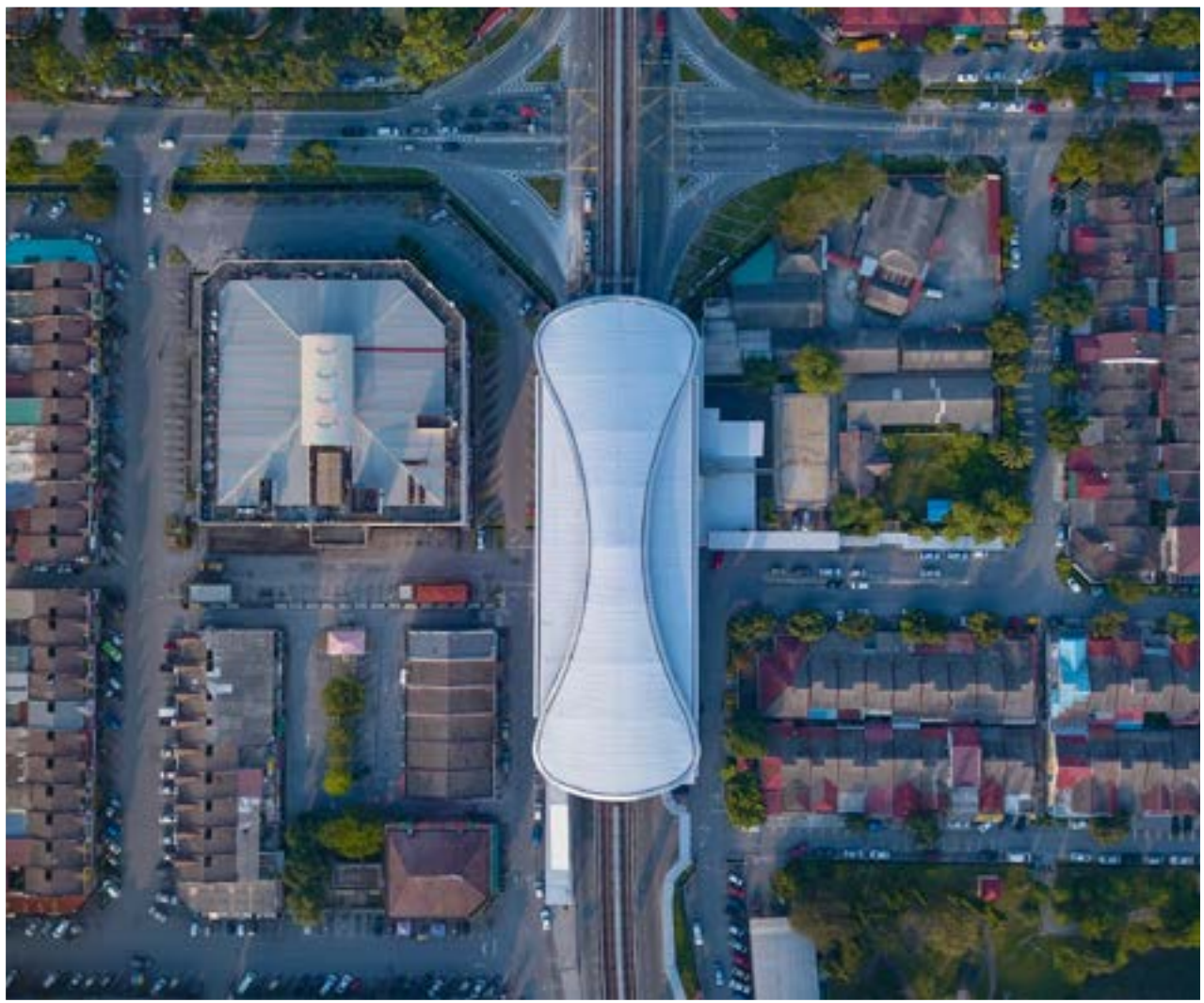
- There is generally a lack of knowledge amongst the public and (local) governments regarding digital solutions.
- For citizens, the smart lamppost raises primary privacy and surveillance concerns, given the data that could be collected.
- Safety concerns may exist for maintenance workers because of more wires and devices in smart lampposts.

Financial

- City budgets are often limited, prohibiting the investment in the transition to smart connected lighting or integrated smart lampposts.
- The need for additional networks (internet, additional power supply) can lead to high costs.

Technical

- The current infrastructure might be too old to host smart technologies. This would mean that new posts need to be installed.
- More technical and safety training is required for workers, given the more intricate technology. Some sensors (e.g. noise sensors) may be difficult to install.
- In order for all the additional functions of such infrastructure to work as intended, it is important to have an uninterrupted power supply. However, this may be difficult in regions with frequent power supply issues.
- Data protection and cybersecurity issues need to be considered as well for the integrated smart lamppost.



Governance/ policy

- There is a conflict between incentives to reduce energy consumption and the promotion of the Internet of Things (IoT) solutions like smart infrastructure which drives up consumption.
- Ownership of the lampposts and operational contracts are a common barrier to the rollout of smart lampposts. The distribution of investment, as well as operational costs, remain open questions.
- Cities may have legal liability if traffic accidents occur due to lights that have been dimmed or because of the equipment malfunctioning.
- The lampposts should not conflict with the public landscape.

Deep dive: projects in practice

Read more about the Humble Lamppost on Smart Cities Marketplace website.

Join the community of the Action Clusters and Initiatives of the Smart Cities Marketplace

The community consists of many action clusters and initiatives with a variety of activities to help to shape the market for smart cities in Europe. These are assemblies of partners, committing to work on specific issues related to smart cities, by sharing the knowledge and expertise with their peers, providing added value with their national and local experience and identifying gaps that need to be filled at the European level. The work of each Action Cluster is collected under thematic initiatives.

An Initiative pools the work of the various partners around a particular objective while promoting learning beyond the project and geographic borders, and opening the results to the world at large. Links with EU-funded projects allow results to be consumed by thousands of active people on the Marketplace. Each Initiative is led by an Action Cluster.

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Designed with love by Agata Smok, Th!nk E