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Demand Aggregation
An Emerging Case Study
The Humble Lamppost

Partner: UrbanDNA

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EXECUTIVE SUMMARY

This report provides an initial case study of demand aggregation of smart lampposts. It addresses associated governance & decision making, technical, business model, procurement, and funding factors. It considers four inter-linked cases of sharing and demand aggregation which are:

1. **Sharing Cities** – activities in London, Lisbon, & Milan; and Warsaw, Bordeaux, & Burgas.
2. **Pan-London** – taking the demonstration activities in Greenwich to a pan-city level
3. **Scale-Up –** engagement of the ~80 Sharing Cities scale-up cities
4. **EIP-SCC Marketplace** – collaborating for scale with the EIP-SCC

This report is intended for any city that may wish to upgrade their lighting stock to LED and install additional smart services; and is open to explore collaborate with other cities. The target reader is likely be the officer who holds, or may hold responsibility to implement smart lampposts for a city.

Demand aggregation involves combining volumes of a product or services from across a number of city authorities (or potentially other parties) to achieve a larger scale, then approaching the market through a collaborative process. This may involve:

- Common approaches to use cases, specifications, business models, or financing and funding;
- Establishing framework conditions for call-off purchasing; to…
- Joint procurement or commissioning

This offers cities (in particular the latter):

- Access to the financial and non-financial benefits of economies of scale
- Greater scale to attract market providers
- More certainty to the supply market and thus stimulation of the (local) market
- Accelerated implementation
- Improved deal terms from investors
- Reduced resource drain through shared efforts

As this deliverable was created in the second year of the five year programme, it does not provide the completed case study. However, the experience so far is valuable learning to share and informs the next phase of the programme. Further case studies will continue to be developed which will also look across the EIP-SCC01 market place.

Demand aggregation continues to present stubborn challenges. Persistence is required to overcome these, and various learnings related to governance, decision making, technology, business models, procurement, and finance & funding are tabled as areas of action.

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1 INTRODUCTION

This section provides the background, direction and context for the report.

1.1 INTENDED READERSHIP

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

In particular, it is targeted at cities that are open to collaborate with other cities in the acquisition of smart lighting.

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

This addresses a set of linked case studies in the process of being developed and is not yet a completed initiative. Given the learning that has been captured to date, it is however offered to the market to share.

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 help to accelerate scale action in the market. The document will:

- **Inform cities** of the benefits and challenges of collaboration on smart lighting
- help **ready cities** for better collaboration and swifter action
- **increase confidence** within cities to act
- **stimulate collaboration, and demand aggregation**, which can lead to better market value (notably for smaller cities that cannot bring scale to the market)

1.3 SCOPE

The report discusses four inter-dependent and developing cases, and specifically:

1. **Sharing Cities** – implementation in London (Greenwich), Lisbon, and Milan, in collaboration with Warsaw, Bordeaux, and Burgas (the former being 'lead cities' in the programme; the later 'fellow cities')
2. **Pan-London** – taking the demonstration activities in Greenwich to a pan-city level
3. **Scale-Up –** engagement of the ~80 cities Sharing Cities scale-up cities
4. **EIP-SCC Marketplace** – collaborating for scale with the EIP-SCC

All are developments that have been discussed in, and are (to different degrees) part of the scope of the Sharing Cities programme.
We explore six factors within these cases:

i. Governance
ii. Decision Making
iii. Technology
iv. Business Models
v. Procurement

vi. Finance & Funding

We have not bounded the report only to these characteristics, for instance we consider user experiences as part of use cases and the like, however they form the core themes for the case studies.

1.4 Working Definitions

1.4.1 The Term "Smart Lamppost"

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, etc)
- 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 more 'traditional' lampposts (that have however been upgraded to low emission (LED) lighting).

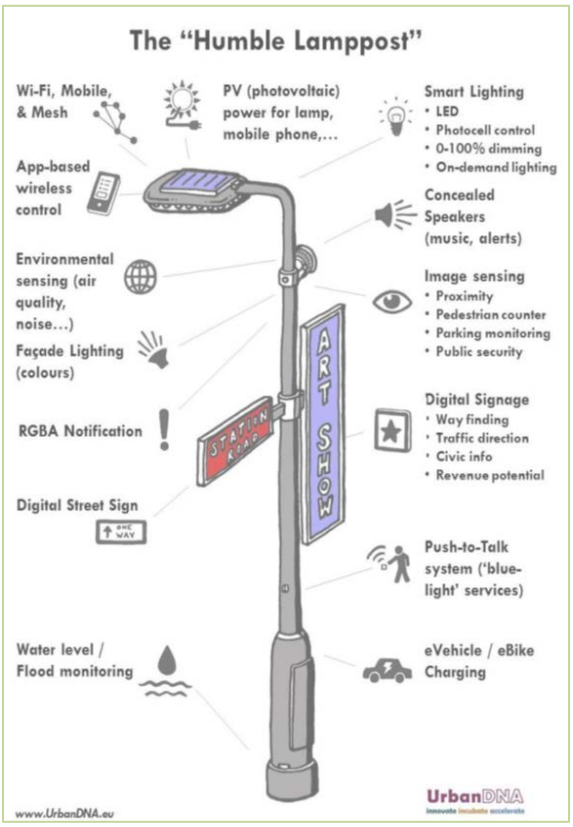


Figure 1 Humble Lamppost Use Cases

1.4.2 The Term "Demand Aggregation"

As a term, "demand aggregation" is only relatively recently used in the context of smart cities. As such it is worth clarifying the meaning we have ascribed it. It is precisely what the words say – adding up volumes of product or services from a number of city authorities (or potentially other parties) and through a collaborative process moving forward in a more common manner.

That collaboration may be in the form of:

- Common approaches to use cases, specifications, business models, or financing and funding
- Establishing framework conditions for call-off purchasing
- Joint procurement or commissioning

1.5 Helpful Support Documents

Below is listed a variety of documents that are referred to in this publication, and / or provide useful additional and relevant background and detail. These are available from Sharing Cities sources, or as noted.

1. ***Humble Lamppost 'Leadership Guide'*** – a 6-page publication intended to inform city leadership (both political and professional) of the opportunities of smart lampposts, identifying 6 leadership actions to stimulate activity
2. ***D3.9 Smart Lamppost Component-Based Design*** – a 60-page 'Management Framework', capturing: Ten Principles that underpin a component-based approach; Market context – demand, supply, investor; Value Chain / Life-cycle logic; Toolkit containing 13 tools mapped to the value-chain, Bill of Materials for the smart lamppost; City Examples; a listing of relevant Standards
3. ***D3.11 Smart Lamppost Multi-Sensor Demonstrators –*** a 35-page document describing the Sharing Cities current state and plans; offering a 'maturity assessment'; and notably capturing details for 10 Use Cases. (Further detail on use case data capture is also available on request).
4. ***DIN PAS 91437 "imHLa – integrated multi-functional Humble Lamppost"*** – a German standard focused specifically on non-lighting Use Case designs
5. ***EIP-SCC Humble Lamppost Specification*** – a development, presently in early draft, to capture the breadth of technical requirements that a city will need to define for a procurement exercise; together with templates to speed the process
6. ***Other Documents*** – a number of other relevant documents are in development:
    a. ***Technical Challenges*** – *short papers addressing specific issues that cities may well encounter (e.g. data backhaul; 12/24 hr power supply)*

2 THE OPPORTUNITIES OF DEMAND AGGREGATION

This section sets the theoretical landscape as regards benefits of collaboration and demand aggregation.

2.1 DEMAND AGGREGATION GOALS – WHAT'S THE POINT OF DOING THIS?

The ***goals*** of demand aggregation may variously be to:

- Access the financial and non-financial benefits of economies of scale (figure 1)
- Provide greater scale to attract market providers (generally industry)
- Offer more certainty to the supply market (design specification; or reduced operational risk)
- Stimulate innovation in the market
- Enable and/or accelerate implementation – for instance giving opportunity to small cities that on their own may not have the wherewithal to go to market
- Attract investors, and / or seek better terms
- Share the burden of effort, and thus reduce the drain on individual organisational resources through the project life-cycle – responding to increasingly constrained public budgets

Demand aggregation is not a new phenomenon and examples exist in multiple areas and in multiple ways.

In the private sector, such synergies are a regular occurrence and underpin transformations in many larger organisations, and are regularly a driving reason for mergers and acquisitions.

In the public sector, the development of regional bodies (e.g. buying agencies) are often a structural means to achieve economies of scale. Collaboration between local municipalities though perhaps hard to accomplish, have also delivered scale advantage. As can be seen from figure 2, this does *not* mean it is a perverse move to erode competition in the market; indeed, it often *stimulates* a market. There is of course an optimum point.

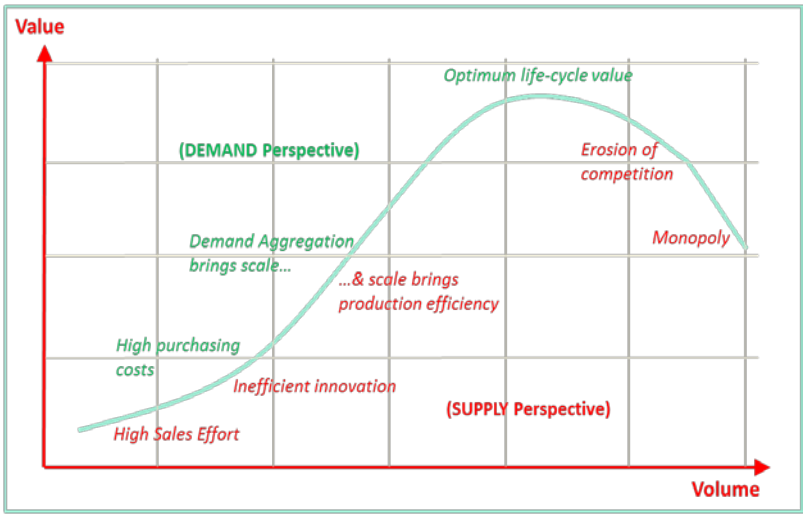


Figure 2 Economies of Scale - Demand and Supply Perspectives

2.2 ACCESSING THE BEST ECONOMIES OF SCALE

A Smart Lamppost initiative is an excellent place for cities to start to explore the benefits of collaboration and find the optimum economies of scale. Individual city volumes are very often well below the optimum value point as regards economies of scale (the left-hand end of the figure 2 curve). Significant double-digit savings can be made through scale – both of purchase price and overall life-cycle value. Figure 3 contrasts a few examples. (NB the volume and percentage figures shown are expert opinion, and have been anecdotally tested in the market).

There are clear design synergies through developing a more component-based approach (think 'Lego') to design, also through the exploitation of standards. These add to the opportunities for scale advantage.

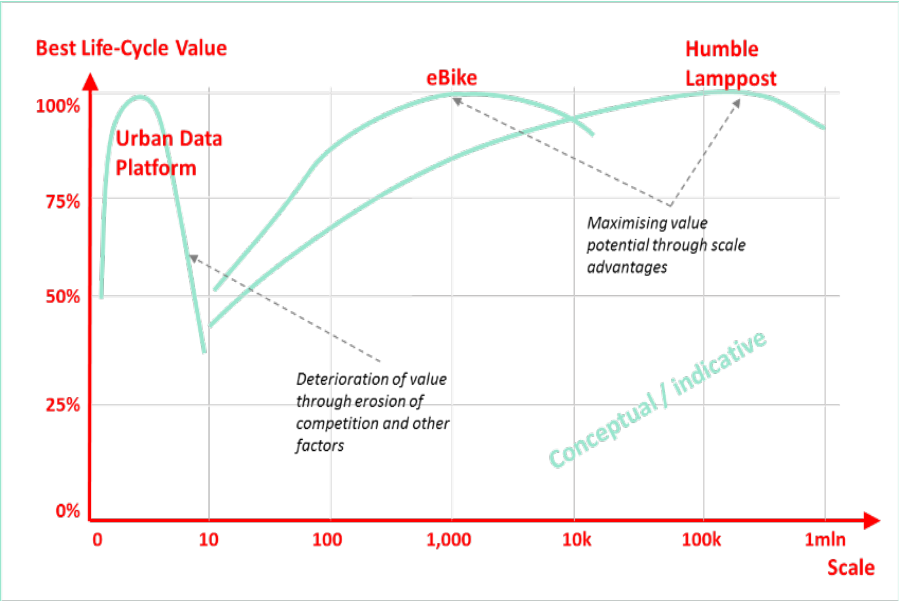


Figure 3 Contrasted examples of economy of scale advantages

Although there are multiple lamppost designs, there is a strong rationale – particularly when one considers adding smart features to lamppost – for integrated and more common solutions.

The indicative scale savings, that could amount to up to 50% in both capex and opex terms, is a strong motive to explore demand aggregation. Initial market sounding has confirmed significant double-digit savings potential in just the purchase price through scale.

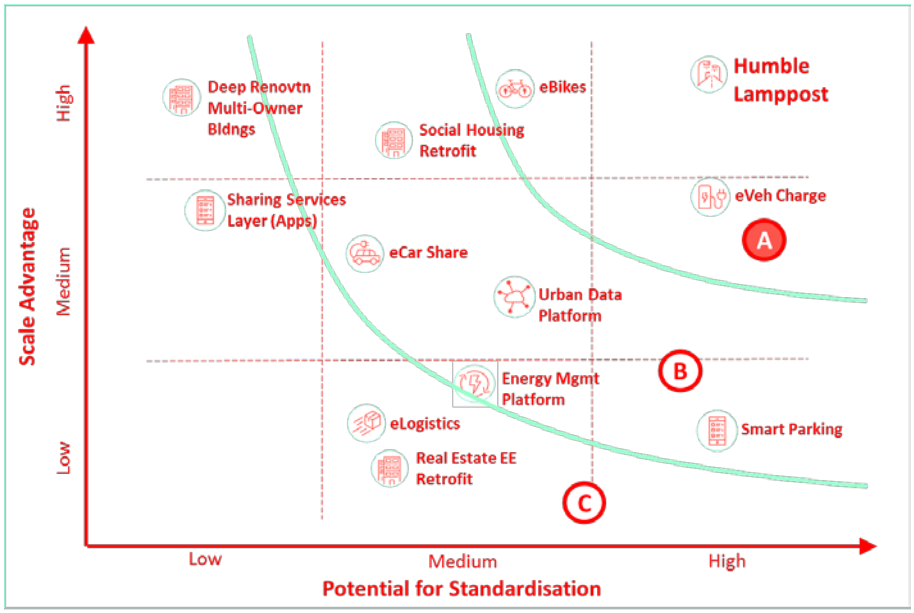


Figure 4 Smart Lamppost – a good place to start

Figure 4 maps a variety of smart city solutions against the dimensions of "potential for standardisation", and "scale advantage". This illustrates the logic for selecting the smart lamppost as being a good smart city starting point to address.

2.3 CAPTURING THE VALUE AT THE RIGHT POINT OF TIME

Up front preparation and planning will lead to better outcomes. Unfortunately it is too common to hear the following when cities approach each other to collaborate: *"Interesting: if only you had mentioned that a few months ago, we could perhaps have done something about it!"*

Demand aggregation is something that must be planned well in advance, otherwise the opportunity will be lost.

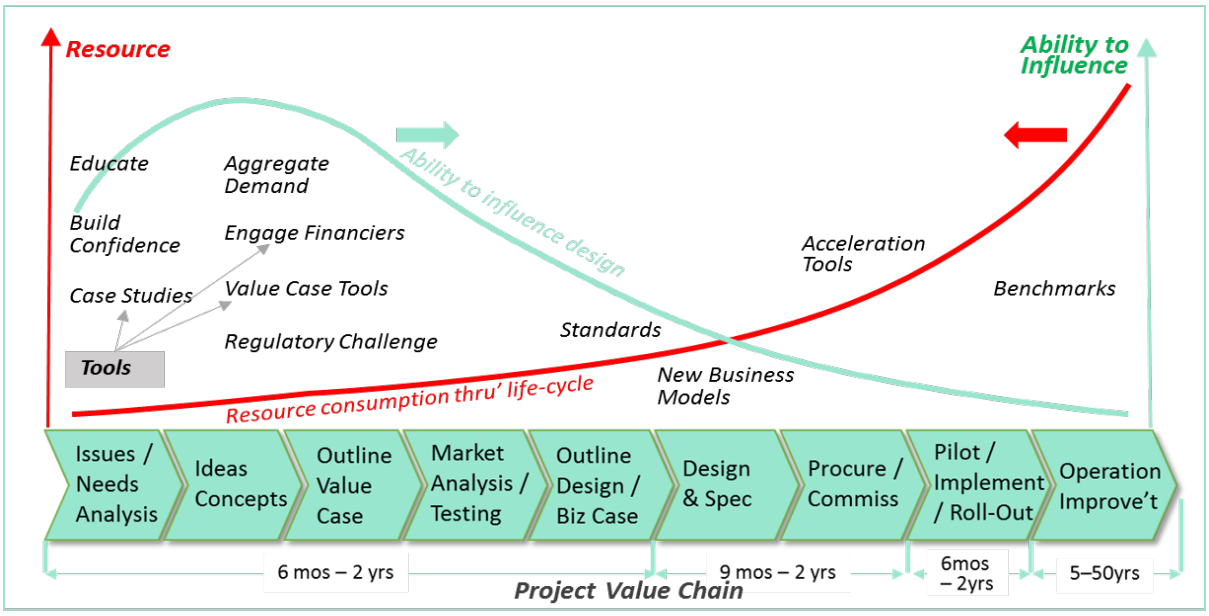


Figure 5 Timely capture of the Opportunity, and means to achieve that

The process is not easy. It requires identifying and aligning with stakeholders in different organisations. However, if done right, and planned early, it can open up new opportunities with considerable value by sharing the burden of effort and reaping the rewards of collaboration and scale noted in section 2.1.

Figure 5 highlights that at the early stages of any project there is far greater opportunity to influence outcomes and that this diminishes with time (after the basic understanding of need). Demand aggregation is one of the instruments that can be used to capture benefits early. And it can (and often should) be explored before significant resource has been deployed.

2.4 WHERE IS THE VALUE?

The concept of economies of scale, and thus financial value, has been covered. Specific to the smart lampposts, there are other forms of (financial and non-financial) value that emerge from different use cases. And these different use cases will influence the extent to which cities might collaborate and thus consider demand aggregation.

Figure 6 considers the spectrum of use cases from lighting only (basic LED luminaire change out) through 'trimming and dimming' (with necessary control systems); to addressing non-light use cases, like environmental monitoring, electric vehicle charging, or indeed more progressive steps to collect and trade data collected via sensors on the lamppost. It also indicates that the initial stages can deliver handsome financial (energy efficiency) savings. That the inclusion of environmental or public safety measures, though delivering value, may well not be seen to be of a financial nature (or at least not converted to financial indicators) – thus create an investment 'dip' in the RoI curve. And

that the likes of eV charging, 5G, parking monitoring, or indeed data trading can attract substantial financial (revenue) benefits. This dynamic considerably influences what a city may wish to do. It is also poorly articulated and evidenced as regards benefits.

So cities that seek to aggregate demand may also wish to consider what shared intentions they may have around specific use cases.

Again, this adds potential complexity however holds benefits of shared resource, de-risking, collaborative piloting, and market influence.

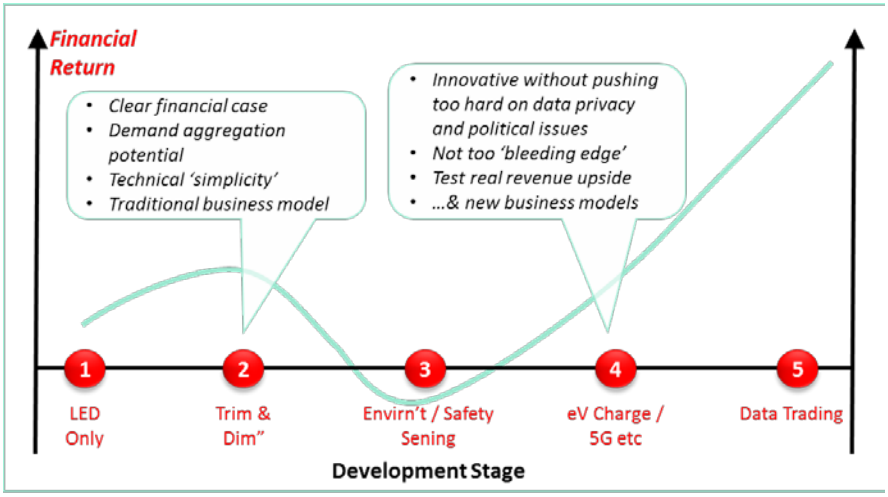


Figure 6 Variable financial returns from different levels of 'smart' ambition

The above sets the context for the four demand aggregation case studies that follow.

3 SMART LAMPPOST DEMAND AGGREGATION CASE STUDIES

This section discusses the four inter-dependent demand aggregation case studies that are presently in process; summarising the context and background, status, forward plans and initial insights; then draws this together in some collective learning.

3.1 PROFILING THE FOUR CASES

The four case studies in question are:

1. **Sharing Cities** – this deals with the 3 lead city demonstrator activities, and engagement with the 3 fellow cities (NB 'lead' cities receive EU funds to implement modest scope of smart lighting; 'fellow' cities variously take an interest in common design, local planning, or potentially aligned procurement activities)
2. **Pan-London** – an example of scale-up within one of the 3 lead cities (of London, via the Royal Borough of Greenwich demonstrator)
3. **Scale-Up –** engagement of ~80 cities that Sharing Cities committed to scale involve in replication or aggregation activities as a means to real international scale action in the market; and alignment with other SCC01 consortia
4. **EIP-SCC Marketplace** – working in collaboration with the EIP "Humble Lamppost" initiative, and SCC01s.

The table below summarises the features of the cases, also addressing the six factors noted earlier.

Table 1 Summary of the Four Case Studies

Case / *Features*	1 Sharing Cities	2 Pan-London	3 Scale-Up	4 EIP-SCC
Purpose	Demonstration as basis for scale-up.	Energy efficiency. Smart London goals.	Prove value of demand aggregation	Accelerated scale adoption of integrated infrastructures
Ambition	Deliver component-based solution.	No specific targets.	To be determined.	10mln smart lampposts across EU cities
Principal Actors	London, Lisbon, Milan. Warsaw, Bordeaux, Burgas + partners.	33 London Boroughs. Transport for London. Greater London Auth.	Up to 80 scale-up cities. 8+ SCC01s & partners	Growing community of cities; Industry; and investors.
Scale	~1,000 lampposts as demonstration in 3 cities; aggregated to 56,000 in 3 lead + 3 follower cities	Using the Greenwich Borough experience to align with the other 32 London Boroughs and Transport for London	TBD for target ~80 ShC scale-up cities. Cross-SCC01 could represent 100,000+ addressable lampposts	10mln target represents 14% of EU total. 75% are >25 yrs old. Low %age upgraded to LED.
Start date	Jan 2016	Q4'16	2017 communications	Dec 2014
Status	City guidance drafted. Initial 'symbol' smart lampposts generally in place. Scale procure't plans in development	Exploring common needs, and joint opportunities	Engagement of SCC01s in process. No significant progress	Ongoing. City guidance documents published. DIN spec published. Planned Pavilion event to mobilise market.
Potential Gains	Demonstration site	Proof of collaborative value across Boroughs	Proof of cross-SCC01 collaborative value	Strategic win for EIP
Governance	EU SCC01 consortium	Complex multi-organisational	Cross-SCC01 collaboration agree't in place	No formal governance. Collaboration via EIP-SCC Action Cluster & Marketplace.
Decision Making	Collaborative as consortium. Individual	Individual Borough & TfL decision making.	Individual city decision making.	No decision making powers.

	within cities.			
Technology	LED upgrade & smart use cases as pilot.	Some LED+smart; some smart upgrades only	TBD	Strive for LED + smart
Business Models	Generally public owned & public or utility operated.	Some PPP structures in place.	Variable	Variable. Aligned to BM&F action cluster
Procurement	Traditional OJEU processes	Traditional OJEU processes. Potential joint procurement.	Traditional OJEU processes	Pre-proc't matching / convening role only.
Finance & Funding	Demonstration EU grant funded (1,000). Likely public funds for in-city scale.	TBD	TBD	Intent to exploit multiple finance sources to generate scale

3.2 SHARING CITIES

3.2.1 CONTEXT & BACKGROUND

Sharing Cities is a €24m EC-funded programme addressing 10 smart city measures (one of which is smart lampposts) within demonstration areas in London (Greenwich), Lisbon, and Milan.

The proposal committed the cities to demonstrate around 1,000 smart lampposts (networked LED-upgraded streetlights with a number of smart services included across the demonstration areas). Early in the programme it became evident that LED upgrade plans already existed in several of the 3 lead and 3 fellow cities (of Warsaw, Bordeaux, and Burgas) involving considerably larger volumes (56,000 lampposts in aggregate). And that the opportunity existed to consider the larger planned volumes within the cities as 'addressable scale'.

3.2.2 STATUS

The smart lamppost is one of the few early measures within the programme, and the approach has been to develop a component-based solution (the analogy of 'Lego') that enables a more common solution that can be tailored to local city needs. The approach is to 'package' measures to easy replication or aggregation.

To date supporting guidance material has been delivered: the Leadership Guide; and Management Framework (D3.9), and Component-based solution (D3.11) which eposes the various potential use cases. In addition, more detailed work has been undertaken to address the specific data needs of each of the use cases.

At a physical level, each city is piloting smart services on a limited number of lampposts, particularly environmental sensing (air quality), and exploratory activities to test different connectivity solutions (notably LoRA).

Joint design and procurement plans to align demonstration and in-city scale activities (i.e. move towards the 56,000 addressable volume) are in development.

Many challenges have presented themselves:

- The 'separate' project activities of Sharing Cities, positioned as a 'research project', is hard to mix with ongoing line-of-business service operations – both tend to fall under different governance and decision-making lines

- Lack of knowledge of, or confidence in, the opportunities available from smart lampposts from all affected departments, and management levels within the cities
- Engagement of and beyond lighting managers, who have to operate to constrained budgets and may face disincentives (cost, complexity) by moving to additional smart services that sit beyond their remit
- Cross-functional engagement and alignment
- Ownership and operational boundaries between city departments and external providers – notably utilities
- Technical hurdles, notably the lack of 24hr power which is required to service many of the non-light use cases

As a result of these challenges delivery schedules are under pressure.

3.2.3 FORWARD PLANS

There are a number of ongoing activities within the programme:

1. Stakeholder management within the lead and fellow cities to engage leadership and decision makers in particular about the benefits and additionality of collaboration
2. Resolve technical barriers (24/12hr power, backhaul / connectivity,) that are seen as local barriers to action and detract from (or delay) exploring broader opportunities for demand aggregation
3. Strengthen the business cases for each of the specific use cases – notably those with clear revenue potential – in order to better engage decision makers with compelling opportunities
4. Support the EIP initiative to develop a templated specification document to help accelerate activities and work to a more common basis which will be more familiar to the market
5. Increase cooperation with SCC01 consortia and their cities, and with the EIP-SCC to share the burden and strengthen confidence in delivered materials
6. Engage with investment community where necessary to open up opportunities for improved access to financing or innovative business models

3.2.4 INITIAL INSIGHTS

A number of critical success factors emerge that include three key ones:

- Ensuring a clear **mandate** from senior levels – to help break open the silos
- **Stakeholder management** – to communicate to, engage, and convince internal city-hall and align with external providers
- Developing a compelling **benefits case** and a clear RoI

3.3 PAN-LONDON

3.3.1 CONTEXT & BACKGROUND

London governance is complex, with 33 individual municipalities with political and professional leadership; the Greater London Authority as a pan-London planning and policy body; with Transport for London (TfL) as a 100% publicly-owned Mayoral service delivery agency. TfL owns and operates ~10% of the (main) roads throughout the city. The London Boroughs collaborate through London Councils, that brings together political, chief executive, and director level groups. There are also a

number of professional networks on a pan-London level.

Pan London collaboration is not the norm. Precedents have been set for occasional collaboration of a 'coalition of the willing'. Public budget cuts are however putting a great deal more pressure on Boroughs to consider transformative delivery models. Theory would suggest that this should be considered a conducive setting for demand aggregation.

Long-term contracts with externalised service providers have been set in place with possibly around 10 of the Boroughs. This is with a limited portfolio of providers, so the same provider may well service several Boroughs.

3.3.2 STATUS

A survey, specific to smart lampposts was launched in 2016. Completion was limited, despite expediting.

A workshop was held with representatives of around 50% of the Boroughs in early 2017. Participants were all officers; and roles spanned policy, transport, smart city, and lighting engineers.

A pan-London inventory of assets has been captured recently (Q1'17) by LoLEG (London Lighting Engineers Group). This collects, for all Boroughs and Transport for London (TfL), the following data:

Captured Data	Comments
• Total # lighting fixtures	• 600,000 (likely 700,000 once all accounted for)
• Total # signs and bollards	• 160,000
• Intent to change to LED	• 60% of responders intend to transition to LED
• Current %age LED	• Range of 1-100% (est ave ~ 20%). ~60% response
• Transition Programme	• Range 1-10years (ave ~ 3years). ~60% response
• Expected %age energy savings	• ~50% expected
• Expected %age Maintenance savings	• 10-40%
• CMS deployment – existing; and new smart city	• Majority have a CMS system in place. Some see it's use to expand to include smart city services.
• Electric Vehicle charging plans (Standard; In-Column; High Powered)	• Majority have standard chargers, 50% plan in-column trickle charge & hi-powered charge (of overall 50% response)
• Sensor Plans for:	• 50% response of which…
o Traffic / Pedestrian →	o 50% intend to implement such sensors
o Gullies →	o 50% …ditto…
o Noise	o 40%
o Parking	o 40%
o Pollution	o 70%
o Security	o 70%
o Other	o WiFi / small cell of interest to 1 Borough

3.3.3 OPPORTUNITY

Given the limited LED extent of LED upgrade, there would appear to be a significant opportunity through collaboration. Opportunities clearly exist for:

- Shared experience of past/current initiatives
- Shared design and piloting
- Common (logical) designs
- Collaborative public sector management of the supply market

- Demand aggregation and joint commissioning / procurement

There are also significant challenges in the way of trans or pan-London collaboration.

3.3.4 Initial Insights

A number of emerging insights are apparent:

- Little progress can be made on 'smart' without having a clear mandate within the Borough
- The business case for 'smart' is insufficiently captured and communicated at executive levels to prompt the debate to do much more than Led upgrades
- No pan-city strategy or pan-city collaboration or financial assessment has been made
- There is considerable interest in Electric Vehicle charging
- Also in environmental monitoring, specifically air quality

3.3.5 Forward Plans

Coordinating resource ('PMO') is presently lacking, and individual Boroughs presently have insufficient incentive to act together. Some form of resource and top-level 'nudge' is required.

Further case studies – evidence from elsewhere – is required to prompt action. In those areas where significant interest has been expressed (EV/Air Quality), this is particularly relevant. Demonstration of high level performance of sensors and chargers is critical to enable investor confidence. Work is ongoing to identify best practice and collate case study examples.

Complete and take the business case for 'smart' to pan-city leadership.

Engage with Borough leaders to seek to engage the person with the mandate and decision making / influencing power.

Plans are however in place to continue to push the pan-London collaboration agenda.

3.4 Scale-Up Cities

3.4.1 Context & Background

80 cities were approached at the proposal stage for Sharing Cities. Scale-Up cities come from right across Europe and are of all sizes and development levels.

Communications with these cities is progressively increasing, as the programme has more of interest to say to them. The humble lamppost is one of the early measures, of the 10 targeted packaged measures.

The Sharing Cities replication and communication activities, as well as cross-SCC01 collaboration on both topics, will play important roles in uncovering opportunities, developing plans, communicating value, and providing a means to engage to this community.

3.4.2 Status

Limited hard progress has been made at this stage.

3.4.3 Forward Plans

As design packaging and initial city demonstration activities progress, the scale-up cities will be

engaged via webinars and the like.

These cities will also be clear targets for the 'Pavilion' events noted in section 3.5.

3.5 EIP-SCC "HUMBLE LAMPPOST" INITIATIVE

3.5.1 CONTEXT & BACKGROUND

The EIP-SCC (European Innovation Partnership for Smart Cities & Communities) www.https://eu-smartcities.eu/about brings together cities, industry, investors and other stakeholders to accelerate uptake, at scale, of smart city solutions through active managed collaboration.

The 'Humble Lamppost' is one of the more developed initiatives, with a goal to upgrade 10 million street lights across EU cities (~14% of the total in Europe). The strategy is to develop an open component-based approach to smart lampposts, with a bias towards initial demand-side action – i.e. condition demand to make an attractive target market for industry.

The initiative launched in Dec 2014. It was championed by Mayor Anne-Marie Jorritsma (Mayor of Almere; President of Council of European Municipalities & Regions; and President of the Dutch City Association), who was also a member of the Commissioner appointed EIP High-Level Group.

In addition to the EIP-SCC initiative, there are now 9 (shortly 12) Horizon 2020 "Smart City Lighthouse" SCC01 programmes in action across Europe that involve ~50 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.

3.5.2 OPPORTUNITY

Given that: there are 60-90 million lampposts in Europe; 75% are more than 25 years old; they represent between 20-50% of a city's energy bill; and ~€3 billion energy cost; that there is potential for 50+% energy saving through LED upgrade; plus ~50% maintenance savings; the energy savings alone represents some €2 billion.

Add to this the potential environmental, public safety, and revenue earning benefits through additional smart features.

Also, the strategic benefits of helping to kick-start cities on their smart city journey; and to demonstrate the goals of the EIP (common solutions, adopted at scale and pace, demonstrating real impact through an integrated and collaborative approach).

Consider the potential export opportunities beyond EU from industry that can demonstrate value delivered in Europe.

And the opportunity is potentially considerable.

3.5.3 STATUS

The Humble Lamppost initiative was one of the first initiatives launched under the EIP-SCC banner. It was launched in December 2014 with the involvement of around 40 participants from predominantly industry and cities.

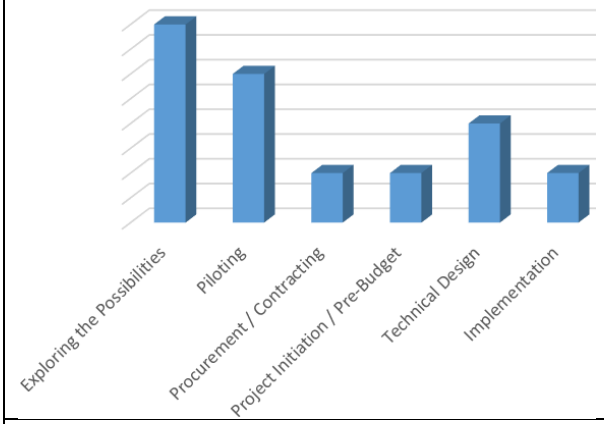
The initial focus has been to work on the demand side. i.e. to seek to inform, support, accelerate coordinated activities within and between cities.

Since then, a number of steps have been taken to prompt collaboration. These include:

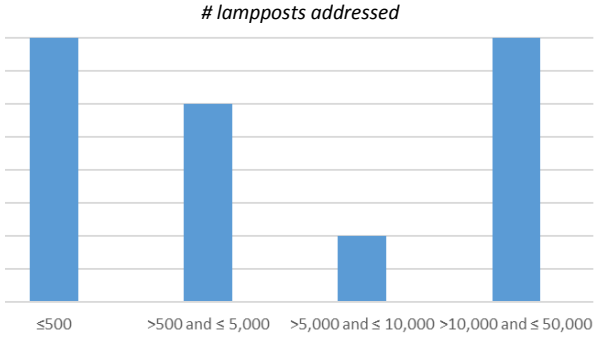
1. Continued visibility and mobilisation through the EIP-SCC activities
2. The proposal to set-up a resourced EU-Hub to help coordinate collaborative activities. This was supported in theory; however parties were not able to commit to resource this.
3. Developing a collaboration amongst a handful of city-clusters, that could access grant funding to cover the initial collaborative design / pre-procurement / city readiness costs. This was initially achieved with 4 city-clusters from across EU (UK, DE, IT, SCC01) collaborating to access EIB ELENA funding, and achieve the capital hurdle of €30mln. However, with the drop out of one significant city cluster this option became untenable
4. Collaboration with the SCC01 Sharing Cities programme, and harnessing mutual publications, notably many of the documents noted in section 1.5

A recent survey of cities has been undertaken which is revealing and informative. The preliminary results of this are shown below. The results are self-explanatory and point to the go-forward opportunities.

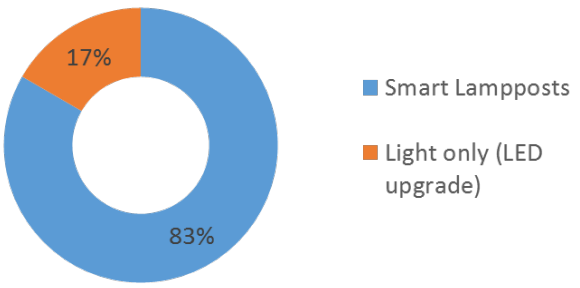
60% still at early stages (so, scope to influence)



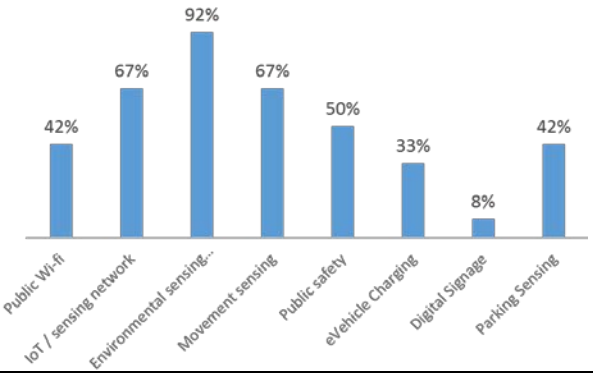
A spread of scales (consistent with mix of pilots and projects)



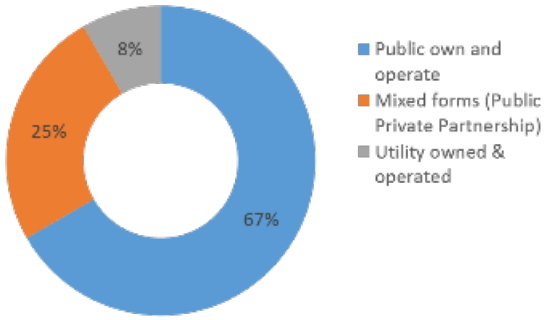
83% want smart Lampposts (cf LED only)



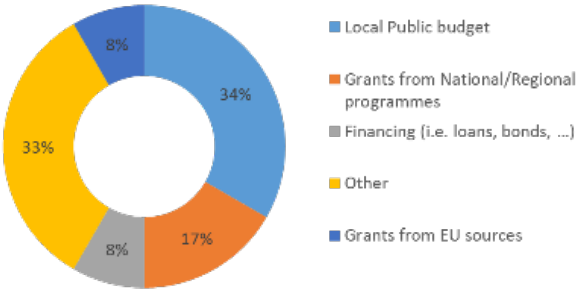
Most Use Cases incur cost (cf reap revenue)



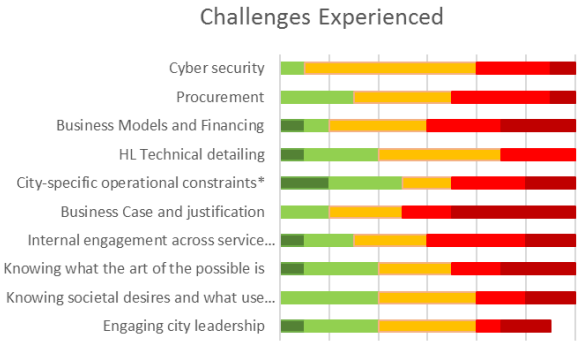
Business Models are mostly traditional



Finance Sources are predominantly public



Challenges mostly financial and organisational



Barriers predominantly financial & uncertainty

- Lack of proven RoI for smart services or clear case for added value services (in a time of public sector cuts)
- The relatively high price; many lamps are already equipped with economical LEDs
- Level of investment; Financing; Budget
- Uncertainty around what services to include to be future proof vs. pragmatic needs
- Pilot phase - testing concept
- Just starting; once we have successful models to replicate, larger scale is foreseen
- Market maturity
- Public perception (big brother)
- Until now, no barriers

3.5.4 FORWARD PLANS

The EIP HL roadmap continues to be updated on a 6-monthly to annual basis which provides a rhythm for forward action. The resources to undertake this work are pro-bono so progress is determined by the availability and commitment of these individuals, which has (and will likely continue to) hamper swift progress.

Greater collaboration with the growing portfolio of SCC01 programmes is planned given that these cities are 'conditioned' in that they have received EU grant funds to execute on this type of initiative.

Set in place a "Pavilion Event" that will bring together demand, industry, and investors for focused and specifically choreographed pre-procurement discussions to help stimulate collaboration and accelerate market action at scale.

3.6 IN SUMMARY

These four cases offer considerable initial learning on which to continue to affect the market.

It has taken longer than most would have expected in all cases to both take the initial (internal decision making) steps, and to make tangible progress in the market and in the field. However, there is clearly potential to do so, and so there is a clear motive to persist.

Steps that can help accelerate early stage in-city readiness

4 CONCLUSIONS

This section offers summary thoughts and a way forward

4.1 COLLECTIVE LEARNING

Key learning, based on the four cases presented, is presented in the table below for the six factors noted earlier.

Table 2 Key Learning

Factor	Commentary
Governance	• Stakeholder management is vital, and should be addressed more scientifically to assure success
Decision Making	• Priority must be applied to capturing a convincing business case for the smart lamppost, and the additionality of demand aggregation
Technology	• Focus is needed to develop trusted standard technical materials that address (i) LED lighting assets (ii) the variety of new and emerging sensing devices (iii) enabling traditional infrastructure (power, poles etc). • A limited number of technical barriers warrant attention (24hr power, backhaul data connectivity) • Technical barriers are not however the disabling feature of smart lampposts or demand aggregation
Business Models	• Innovative business models that involve public and private sectors – notably bringing in investment – can help incentivise collaboration and accelerate progress
Procurement	• Flexible component-based and templated specifications (including the various set of standards) are essential to
Finance & Funding	• Financing is required well beyond present limited lighting operational budgets • External investor involvement can help incentivise demand aggregation • Cities will need to take a position as regards potential revenue streams (e.g. eV charge, data trading, or just using lighting assets as a revenue source). This may require policy or regulatory action.
Other	• Involvement of society can help nudge change. Call centre complaints on lighting outage offers a motive to upgrade. Community involvement in location and scope of smart features can help to mobilise various city departments. (Some cities are notable in this: e.g. Bristol, Eindhoven)

4.2 FROM LAMPPOSTS TO …?

The smart lamppost is recognised in most reported press, conferences, and cities as a smart city "quick win". It sits alongside a handful of other potential relatively swift improvement opportunities, including parking and waste services, where there are relatively obvious tangible (financial) benefits.

As such it is important that we learn as much as we can along the way about:

- How to accelerate delivery of these opportunities
- How we can package up solutions in such a manner that we reap the benefits of standardisation, and at the same time leave sufficient scope for local choice
- How we can address the non-technical enablers of progress

The need for us to "get the smart lamppost behind us" and get involved with other opportunities is very real. The humble lamppost can contribute significantly towards the EU 20:20:20 targets, however we must complete on this relatively easy opportunity in order to build the confidence and turn attention towards the more challenging opportunities.

4.3 Next Steps

The Smart Lamppost is a recognised city 'quick win'. Progress however proves to take significant time and experiences an ongoing set of challenges.

We must persist, as there is a clear financial gain from scale upgrade to LED, and additional value from smart services. If we cannot prove the potential of collaboration on a relatively simple solution such as smart lighting, what will occur when we tackle the more complex smart city challenges? And what does this do to Europe's chances to deliver on its 20:20:20 goals?

Case studies of demand aggregation – be that collaboration on common requirements or more progressive joint acquisition – provide stimulus, ideas, and confidence for cities to act; so more open capture of successes and lessons learned is a priority.

In summary, the suggested principal next steps are as below.

#	Next Step	Action Party (& role)		
		ShC	EIP	Other
1	Continue the ShC collaboration activities and capture of materials and evidence based data	Y		
2	Actively progress the in-city replication activities within ShC cities (notably the London case)	Y		
3	Collect and disseminate case studies (of smart lampposts, and of collaboration)		Y	
3	Engage with the investor community to stimulate incentives for collaboration	Y	Y	
4	Pro-actively collaborate across the SCC01 community to stimulate demand aggregation	Y		
5	Convene cities; as well as industry ecosystems and investors to stimulate collaboration (the 'Pavilion' concept)		Y	Y