

LIGHTING & BEYOND

A toolkit to speed city-wide decision making & benefits by repurposing the 'Humble' Lamppost'



SUMMARY

Replacing legacy lighting by Light Emitting Diodes (LED) offers cities safer and better lighting conditions, combined with very substantial savings. Such projects are highly bankable, and their benefits have been proven around the world.

Looking beyond lighting, there is also additional and growing potential offered by treating the lamppost as a city-wide array of powered assets that can be used to deliver a wide range of additional services, with resulting greater public value.

Cities today are presented with a rare opportunity to repurpose the 'humble lamppost' and make a marked positive impact for their communities.

How to go about this? How can a city capture the bankable gains of LED upgrade, adopt some of the more obvious new features, and future-proof for uncertain change? How can cities access the funds required to go about such scale change? Where is the internal capacity to make such change real? And how can decision makers mitigate the risks, yet capture the rewards?

The development and demonstration work undertaken by the European 'Lighthouse' smart city community, European Innovation Partnership for Smart Cities and Communities (EIP-SCC)¹ and a supporting network of international experts, offers a rich foundation of smart lamppost deployments and considerable captured learnings and assets.

This paper outlines a toolkit that offers a basis for informed decision-making, that can instil confidence, ensure consistency and transparency in project screening and due diligence. It brings together three important components by which a city or region can capture the advantages of scale adoption of smart lampposts:

- The first involves the considerable and growing portfolio of content as a result of ongoing collaborations. This follows the '**packaging**' approach that describes the 'what' and the 'how' of smart lampposts to enable a city to tailor solutions to their local context
- The second involves a digital '**decision support tool**' that provides a consistent rigorous basis for cities and regions to create and evaluate different project scenarios, and from there, develop their business case to upgrade lampposts
- The third outlines a **roadmap** by which a city can bring the various stakeholders together to make swifter and better decisions, to build and share capacity, and then implement with confidence.

Bringing these three together reduces up-front project cycle times, enables cities to exploit the potential of city-to-city collaboration, strengthens the quality of delivery, ensures efficient use of public funds, and maximises public value.

Every day, inaction incurs lost financial and non-financial opportunities for cities. Now is thus a good time to change that.



¹ More information about [Lighthouse Community](#) and [EIP-SCC](#)

CONTEXT

There are a handful of sensible actions that cities can take with confidence that add value and deliver bankable savings. Upgrading the 'humble lamppost' is one.

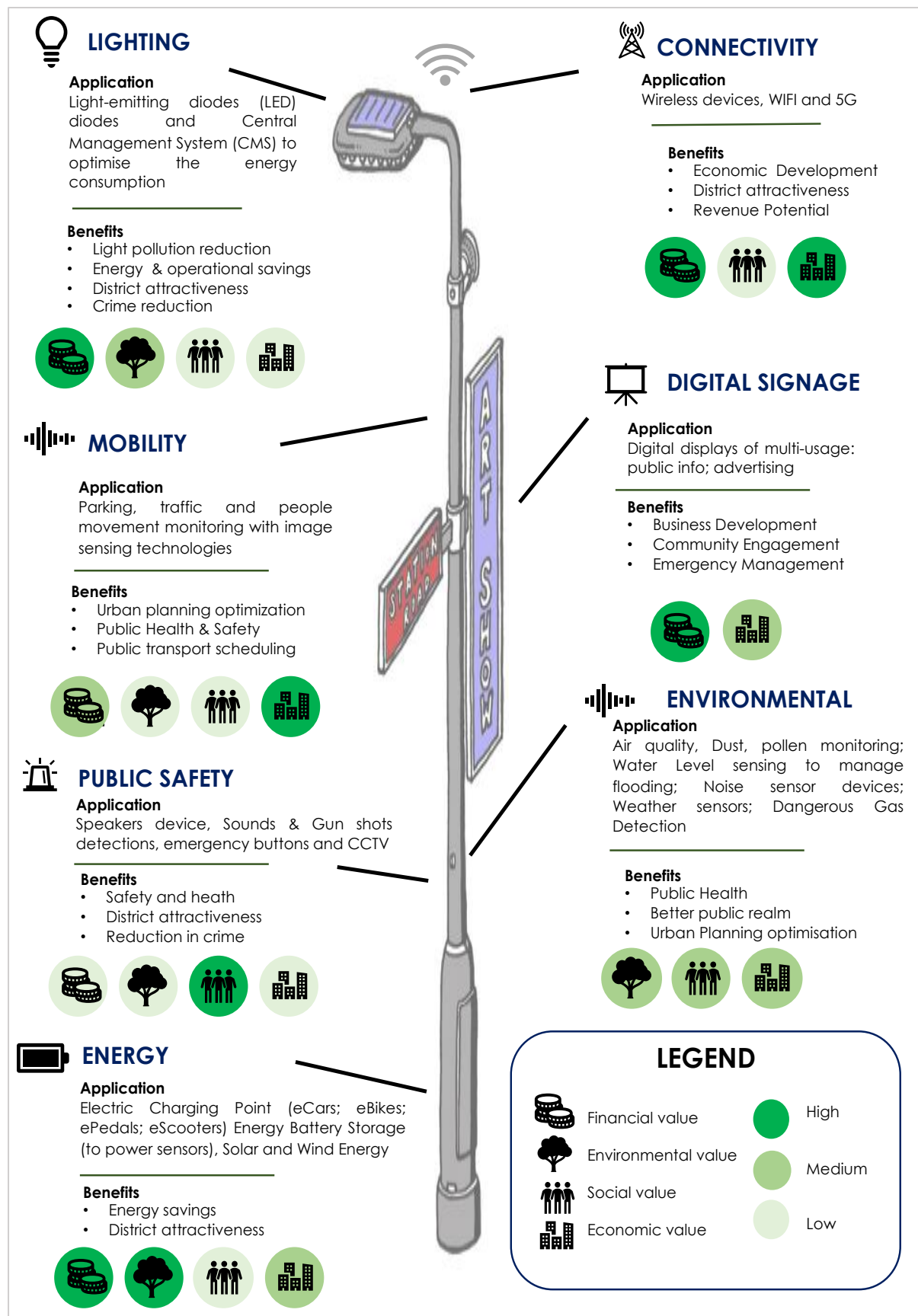


Figure 1 The Multipurpose 'Humble Lamppost'

Innovations in the market undoubtably hold much potential, yet many cities struggle to take their first important steps, or to move from small-scale pilot activities to deliver real tangible scale benefits. Doing something practical at city or regional scale on smart lampposts can provide that quick win that builds confidence for more.

For every 6 - 10 residents in a city there is one lamppost. That's 60 - 90 million in Europe; 200 million in America. These consume 20-40%+ of a city's overall energy budget. By just changing out the old luminaires with LED, better safer places result, and real quantum savings result, of 50 - 80%. That is now well proven.² In the developed world to date, only a small double-digit percentage have been upgraded, so there is considerable untapped value yet to be had.

Every city can benefit. And it is not just in energy savings. This network of powered poles can be considered as a city-wide asset that can serve many more functions than just the core and important provision of light (figure 1). And the benefits increase further if cities can collaborate and deliver economies of scale.

Developed cities can gain through upgrading their existing assets, much of which are aging (75% of EU stock is >25 years old). Cities in the fast-developing world can 'leapfrog' by installing new multi-functional poles. And with a more standards-based approach, designs can be made open, inter-operable, and future-proof.

A recent EU survey³ indicated that only a few cities have reaped the savings of LED upgrade at any real scale. Yet fewer have done much more than small-scale piloting of the additional smart features.

This can now change. However, there are several challenges to overcome that block scale upgrade. Challenges that are faced in every sector that plays a role in the solution. Table 1 highlights these.

Table 1 Principal demand, investor, supply-side challenges in tackling the smart lampposts market

Demand		
<ul style="list-style-type: none"> Typically, cities upgrade lighting stock in small portions (~5% pa), leading to dis-economies of scale Small scale projects that are disproportionately costly to execute, and often with bespoke specifications Slow and complex decision making & lack of internal knowledge Interest to access swift LED savings, without further attention on 'smart' additional services Limited capacity to address 'smart' upgrades (notably smaller cities); thus reliance on industry or advisors Challenges in engaging and articulating value to communities Lack of alignment between top and bottom of office, and challenges of cross department collaboration Different ownership structures and business model options that limit scale potential Lack of funds, notably to achieve scale (though no lack of money in the market) Limited understanding of costs and potential returns 		
Investors	Supply	
<ul style="list-style-type: none"> Insufficient volumes to excite scale investors Lack of understanding of and trust in returns streams (savings and revenue) in smart cities Lack of understanding of public value and the monetization of public data 	<ul style="list-style-type: none"> High sales cost in meeting and responding to multiple cities' needs and procurements Limited scale & certainty to support R&D activities Poor foundation to stimulate (local city) SMEs Lack of standards and protocols (for smart fixtures) 	

Consistent guidance and tools can help cities move forward faster, de-risk their investments, improve the quality of solutions, improve affordability, and increase delivered public value. The three components of **packaged content, decision support tool, and roadmap** are important steps to offer cities the chance to move forward with confidence.

² [Future of Street Light](#)

³ [EU Survey Insight Paper](#)

PACKAGING

'Packaging' describes open replicable and interoperable approaches, methods and solutions that are designed by and for cities. It captures the 'what' and the 'how' for smart lampposts in practical recognisable documents and tools that cities can become familiar with thus trust. It builds confidence to speed and de-risk decision making. And it enables multi-city collaboration to access economies of scale. The result will also be beneficial to the supply market, as it provides more certainty (notably for SMEs), and greater scale. And that gives investors more confidence, which accesses funds to supplement scarce public budgets.

A good analogy for packaging is that of Lego. It is a common platform, supports easy implementation precisely as per the instructions, as well as liberates innovation through being interoperable and component based. Lego neither constrains innovation, nor results in a 'one-size-fits-all' solution.

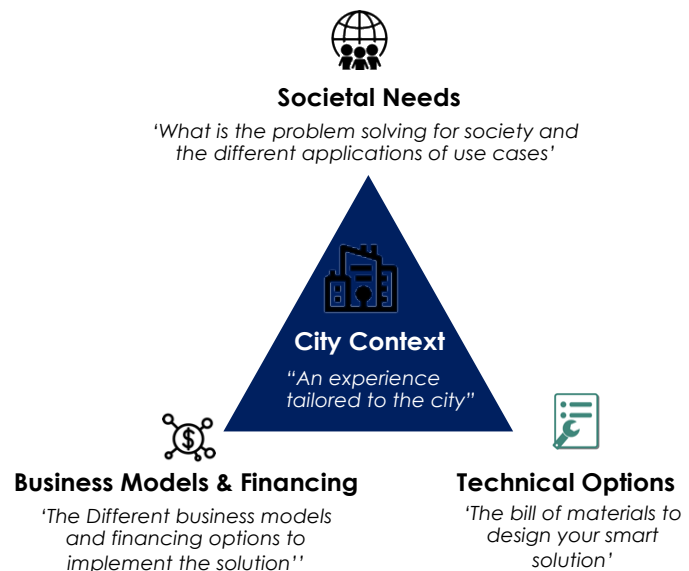
The packaging approach is increasingly being applied within the EU-funded smart city 'Lighthouse' programmes, now involving more than 100 cities – a substantial means to prove and legitimise.

Guidance is offered across 4 major stages of a project's lifecycle for different stakeholders (i.e. engaging stakeholders, making the case, implementation, and sustaining value). The documents are written to the range of audiences that need to be involved to ensure successful decision-making and implementation: politicians, senior city officers, infrastructure and service heads, financiers, project managers, and not unimportantly people.

Packaging brings together three important themes in a logical framework that are all too often dealt with separately (and thus threat to success), being:

- societal needs (captured as use cases) – capturing the better outcomes that result
- technical solutions – identifying the various ways by which needs can be fulfilled
- business models, financing options, and value indicators – how investments can best be made

...and then relates these to the specific context of a city, in a structured manner.














The benefits of this standard, configurable, and affordable approach are significant, and include:

- Accelerated decision-making in cities, thus shorter project cycles
- Support to demand aggregation and thus economies of scale
- Access to market for the highly fragmented smaller cities market
- Better understanding of the alternative technology configurations
- Greater confidence of the investor community
- A fairer playing field for SMEs and big industries due to consistency and standards
- Greater quality, lower price, and shorter delivery – in short greater lifecycle value

A growing portfolio of packaged content is in delivery. The current status is shown overleaf:

“Humble Lamppost” Packaging Portfolio

The Humble Lamppost solution is the most developed portfolio with, to date, 12 documents produced, and some tested with cities in collaboration with different EU programmes. This foundation offers a common platform of templates and guidance to support and lead the delivery of packaged portfolios for other EIP-SCC or Smart City ‘Lighthouse’ programme measures.

Stage 1: Engaging Stakeholders	 Leadership Guide A 6-pages document clarifying for politicians and city leaders the opportunity of smart lamppost upgrade. Status: 80% draft	 Smart Booklet A 10page document targeted at the multiple city service owners that could benefit to provide a basic understanding of the key opportunities. Status: 80% draft
	 Smart Leaflet A 1-page brochure to raise awareness in the communities who live and experience the city. Status: 80% draft	 Management Framework / ‘Playbook’ A core document supporting city project officer to help align across various infra / service heads; to time-compress decision making. Status: 80% draft
Stage 2: Making the Case	 Decision Support Tool User Guide A digital online platform evaluating bankable smart lampposts projects directed for variety of cities decisions markers. Status: 80% Draft	 Investor Guide An easy read to raise confidence among investors and clarify the potential value of smart lampposts. Status: 80% draft
	Business Model & Financing Short Document capturing the different business models and financing options Status: No draft	 Market Analysis A quick read capturing the market context for a smart lamppost Status: 100% (EIP-SCC)
Stage 3: Implementation	 Buyer's Guide A market catalogue to inform cities on the different smart lamppost providers Status: 50% Draft	Procurement Template A Structured procurement template for use by buyer, however known by suppliers to help expedite and improve procurement process. Status: No Draft
	Functional Requirements & Technical Specification ~50-100 pages document on detailed specifications and tools; collaboration with BSI and 2 other national standard bodies Status: Proposal out for sponsorship	 Standards Listing Identify the various applicable standards for design and procurement Status: 20% Draft
Stage 4: Sustaining Value	 Value Monitoring Indicators Listing indicators (financial and non-financial) relevant for the Smart Lamppost Status: 50% Draft	Replication and Scale Guide Short 10-page guide including bench learning, collaboration and replication criteria. Status: No Draft
	Demand Aggregation Case Studies 10-20 pages documents to support market aggregation to access economies of scale and support replication from city to city Status: No Draft	 Market Case Studies 20-page structured document capturing different case studies to ensure awareness of market needs and innovation. Status: 50% Draft

These documents will, as is appropriate, transition to National or International Standards Bodies to sustain their content and increase their market impact. The status of development steers the availability of the draft documents for particular audiences.

DECISION SUPPORT TOOL (DST)

The Decision Support Tool provides a swifter and practical approach to decision making. Public Sector bodies can take several years to move from idea to implementation. Accelerating this process, through speeding decision making in cities has obvious advantages. To do so requires informing and aligning multiple parties, at several levels, and often from different organisations. It presents a complex stakeholder management challenge.

The Decision Support Tool (DST) seeks to guide cities through the process of delivering greater value and developing bankable smart lampposts projects, keeping the decision power clearly within the city. The process is supported by an online platform, that aligns with and builds on the packaging materials.

The DST presently the user to complete three tasks:

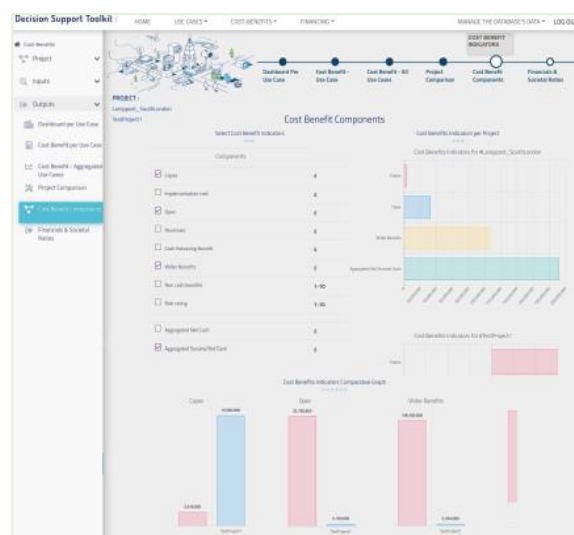
- firstly, scope realistic project options based on current city ambitions and evaluate use cases
- secondly, assesses the relative value of the various options considered – through a detailed cost benefit analysis, addressing socio-economic-environmental value
- thirdly, computes a project bankability score, and recommends optimal business models against standard metrics, to deliver a project's financial summary.

Task 1: Project Scoping

Module 1 offers a simple method to scope realistic project options, that best meet the city's vision and development programme. The first step is to select the different use cases that a smart lamppost may offer by using a set of commonly used smart city project criteria, based on the work of the EU-funded CITYkeys project. These criteria allow the user to rate and score the different use cases against the backdrop of financial, environmental, scalability and other benchmarks to show in a transparent way those that are the most relevant for the city.

Task 2: Full Value Assessment

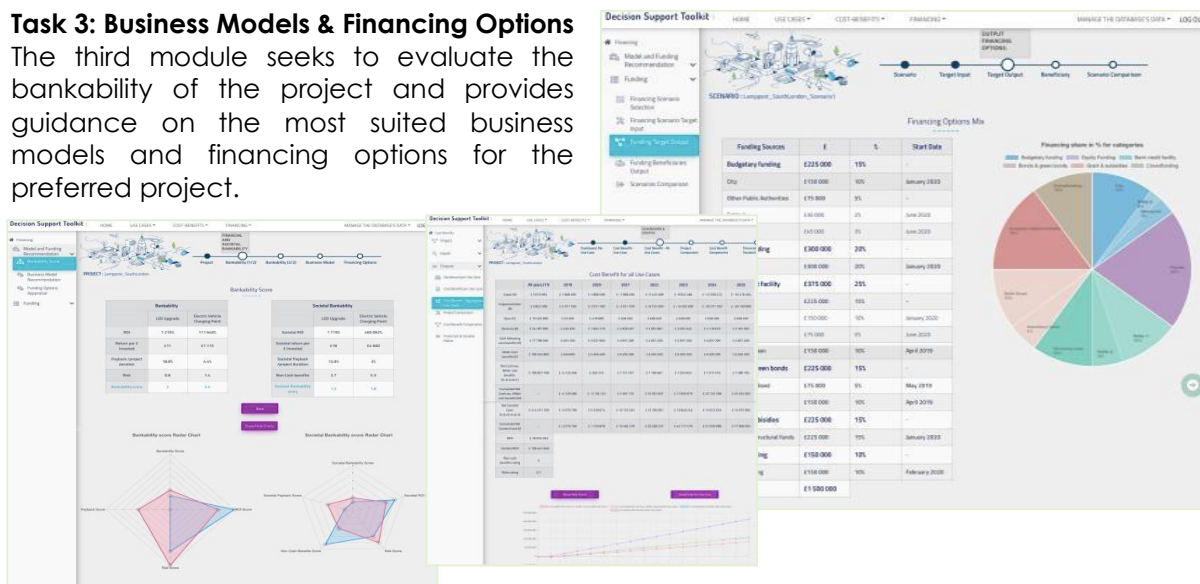
Module 2 allows a city to quantify a project's economic and societal value – taking into account financial and non-financial items – which are either monetised or factored into the assessment. This Cost Benefit Assessment (CBA) section requires the user to input detailed data, such that computations are made by the tool to assess a project value in financial term e.g. investment components, financial and timeline saving gains of using the Humble Lamppost collaborative process and economy of scale, revenues, energy savings and operating savings; and also through a non-financial lens: Co₂ savings, light pollution mitigation, sustainable development goal (SDG) impact, health, social and economic value.



This module provides detailed outputs on the project cost/benefit profile, and its budgetary impact for the city. It enables comparison between projects based on a range of selected metrics e.g. Return per €/£/\$ invested, Financial/Societal NPV, Payback/Breakeven, and the like.

The third module seeks to evaluate the bankability of the project and provides guidance on the most suited business models and financing options for the preferred project.

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An additional **module 4** is planned to monitor the value and the project performance for investors requirements and cities.

DST is an end-to-end platform that enables a city to design, evaluate, and optimise a number of projects and financing scenarios. A clear value-adding feature of the tool is that it can be used to compare projects which come in different shapes and forms, with different types of value, amongst decision makers and influencers that view value through different lenses and with different priorities. For instance: prioritised energy and operational saving (LED) only; modest use case internally driven pilots, multi-functional smart lampposts supplier offerings, multi-use case large perimeter projects, etc. All using a consistent method. In this way, not only does the tool accelerate decision making, it also provides an undisputable and transparent step-by-step process to reach consensus.

Summarising the benefits of the Decision Support Tool (DST):

- **Supports the project from end to end:** enabling different opinions / orientations to be evaluated (financial, societal, environmental, governance)
- **Aligns stakeholders, accelerates decisions, and optimises value** to city, and society at large
- **Pragmatic and modular:** not overly complex, granular enough to validate the business case for city officials and investors, does not include technical jargon, and is simple and modular by design to include potential new use cases. It is web-based, secure & compartmented
- **A structured rigorous method:** DST offers Integrity throughout the process and is aligned with Government guidance⁴, supporting multi-stakeholder workflow-type access. Using EC-supported indicators⁵ to ensure consistency and quality assessment
- **Guidance:** Users input data through different stages, however the tool is not entirely dependent on user inputs. The user is guided through each step and indications are suggested for input data, based on extensive research, notably on costs and value of each use case
- **Convenient capture of the decision-making audit trail:** to support and sustain transparency, comparison, and accountabilities
- **Extendibility:** The Smart Lamppost is the first smart city solution to be supported in this manner. New areas such as building retrofit, electric bike are currently being explored to develop new applications for the decision support tool. Further development is planned to demonstrate the value for investors of smart city projects.

⁴ Consistent with UK Gov 'Green Book' approach providing a comprehensive baseline for any public project business justification

⁵ CITYKeys: an EU-funded Research Study which benchmarks and scales out European cities' ambitions and their smart city projects

ROADMAP FOR SUCCESSFUL APPLICATION IN CITIES

Bringing the packaged content and the DST support platform together to inform, engage, commit, fund, own and deliver a smart lamppost project within a city, or amongst a group of collaborating cities requires management. The illustration below offers substance and order to how things come together to reduce time and risk, bring order, and improve outcomes.

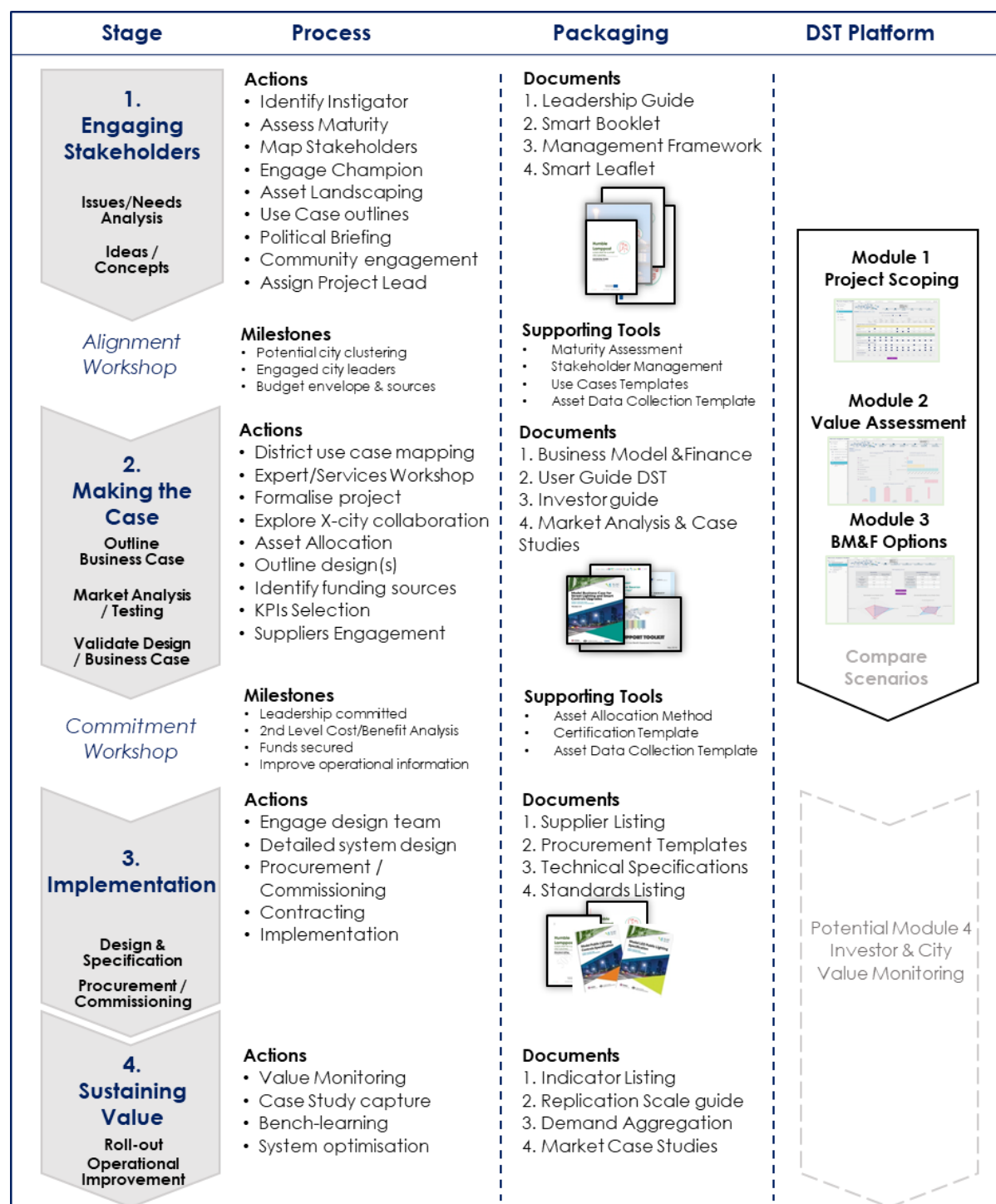


Figure 2: Roadmap for Humble Lamppost Packaging & DST application

Each application of course requires tailoring to local circumstances. There will be specific needs, priorities, and constraints; different parties, sectors, and asset ownership structures; particular regulatory, fiscal, financing and funding circumstances. These may result in some use case options, business models, and technical solutions being more or less attractive.

However, the content, tools, and process support outlined here undoubtedly offers cities the ability to move forward faster, with confidence and certainty, and access the considerable added value from this early and obvious smart city quick win.

END NOTE

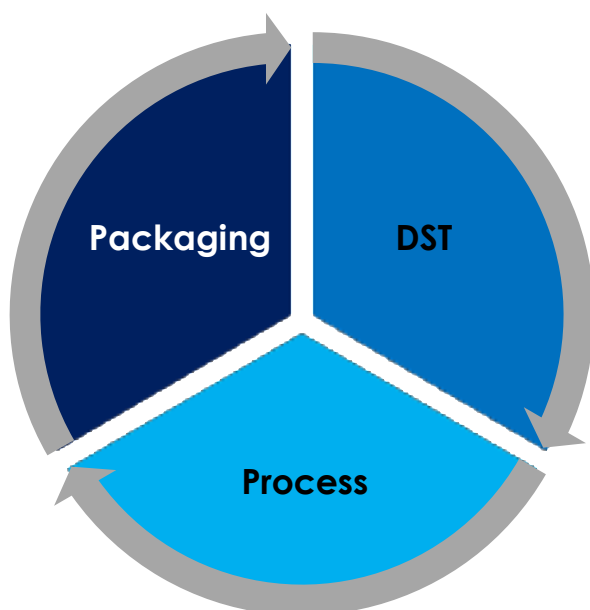
This is not a static process. Technologies will continue to develop at pace. Community opinions will continue to change. Business model options, financing schemes and fund sources will evolve. Cities will hopefully increase their level of working together to prove the value of collaboration, and through doing so deliver scale solutions swifter to the benefit of communities, public budgets, and the supply market.

Likewise, the support materials and tools will continue to evolve through application and learning within cities. Additional content will be captured and curated adding considerably to the quality of materials available to cities. Content will be transitioned to standards organisations so that the process is formalised and sustained.

All parties play key roles in making this work. Internationally.

Our collective goals are common, to:

- Make our cities more attractive, inclusive, and safer
- Deliver better smarter infrastructures and services
- Reduce unnecessary consumption of resources
- Build capacity and confidence in the market
- Access the potential value faster and at scale



FOR FURTHER INFORMATION
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