Economic benefits of multi-functional smart urban lighting

It is crucial to design a well-functioning economic, institutional and contractual framework, adapted to the local context.

Main upcoming smart functionalities

Framework design requirements

1	**Energy production** Such as decentralised wind,[1] solar[2] ...	**Electricity net metering model** ... answers to the challenges of costs, security of supply and CO_2 reduction.
2	**Network transmitters** The existing lampposts offer an ideal platform for ...	**Infrastructure marketplace management** ... a dense network of 5G antennas, or other smart devices requiring a physical support.[3]
3	**Sensor-based services** The development of Internet-of-things business models ...	**Neutral host operating model** ... needs an open environment for operators, avoiding vendor lock-in.[4]

LED lamps for outdoor lighting is a fast-developing technology. The upcoming smart urban lighting innovations revolves around Internet-of-things applications, enabled by 5G networks. Cities acting as early adopters will have a better chance at succeeding, by building up knowledge and attracting investments to their local innovation ecosystems.

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See next page for more information

Economic framework design for the multifunctional lighting smart city

Only a properly designed economic local framework will support new business and revenue models that truly benefit the city's economy and the citizens' long-term well-being. The "smart city" paradigm requires new administrative strategies. For multifunctional lampposts consider at least:

Managing the relation with the power grid. A net metering legislation (NM) is recommended to support the diffusion of decentralised energy generation.[2] NM means that both self-consumed electricity and surplus electricity are valued at the same price (as opposed to net billing, where surplus electricity is valued at a lower price than if bought from the grid).

Managing the use of streetlamps as physical support to other physical devices, such as 5G antennas. The context determines the level of demand for access to the existing network of poles. A wrong framework might lead mobile network operators to over-compete and litigate against the municipality,[5] delaying the adoption of 5G. In low-demand situations, the municipality might have to support 5G adoption instead of charging fees for the installation of antennas.

Managing the data economy. Cities manage large amounts of data that could be used to create new services or improve existing ones. IoT (internet of things) sensors measuring for example air quality, parking pricing, or charging stations for EVs, will make internet-enabled lampposts a natural collecting point for this data economy. However, the local operator and the city administration should act as a "neutral host", allowing both cooperation and competition between service providers in the data platform.[4]

Creating additional business potential. The functions and IoT features connected with the lighting unit can provide new earning possibilities based on utilisation of commercial data of and for consumers and tourist (information to both directions).

Understanding new service value models: the business model canvas

To understand the new services enabled by your smart urban lighting project, it is useful to use the business model canvas (example to the right). You can fill in the canvas together with any stakeholder, such as technology providers, local entrepreneurs or the city energy company, to explicit changes and inform better policy decisions and support local economic development.

<table>
<tr><td rowspan="2">KEY PARTNERS
Air quality company, transport company, local businesses</td><td>KEY ACTIVITIES
Negotiating incentives, marketing, managing fees.</td><td rowspan="2">VALUE PROPOSITION
Air quality monitoring and local shopping incentives for sustainable transport.</td><td>CUSTOMER RELATIONSHIPS
App with notifications, local vendors.</td><td rowspan="2">CUSTOMER SEGMENTS
Citizens</td></tr>
<tr><td>KEY RESOURCES
Lampposts, app.</td><td>CHANNELS
Public transport, businesses.</td></tr>
<tr><td colspan="2">COST STRUCTURE
Additional budget for the managing city tourism office</td><td colspan="3">REVENUE STREAMS
Infrastructure use fees, percentage on shopping transactions.</td></tr>
</table>

References:

1 For an example on the upcoming urban micro wind energy solutions, see the O-Wind Turbine, winner of the James Dyson Award 2018. (https://www.jamesdysonaward.org/2018/project/o-wind-turbine/).

2 For net metering, see: Jussi Vimpari, Seppo Junnila. Estimating the diffusion of rooftop PVs: A real estate economics. Energy 172, 2019.

3 For an early example of infrastructure marketplace, see: https://smartlamppost.com (a joint venture between three of the most important players in Europe, in metal structures, Telecoms, Power and Smart Cities.

4 About the neutral host approach, see the Nokia BellLabs and City of Espoo consortium for 5G Lamposts, Luxturrim: https://www.luxturrim5g.com/new-blog/2019/11/4/nokia-driven-luxturrim5g-smart-city-ecosystem-extending.

5 For a short description of the 5G litigation problem in the UK, see: The Guardian 19 May 2010, "Revealed: 5G rollout is being stalled by rows over lampposts".