

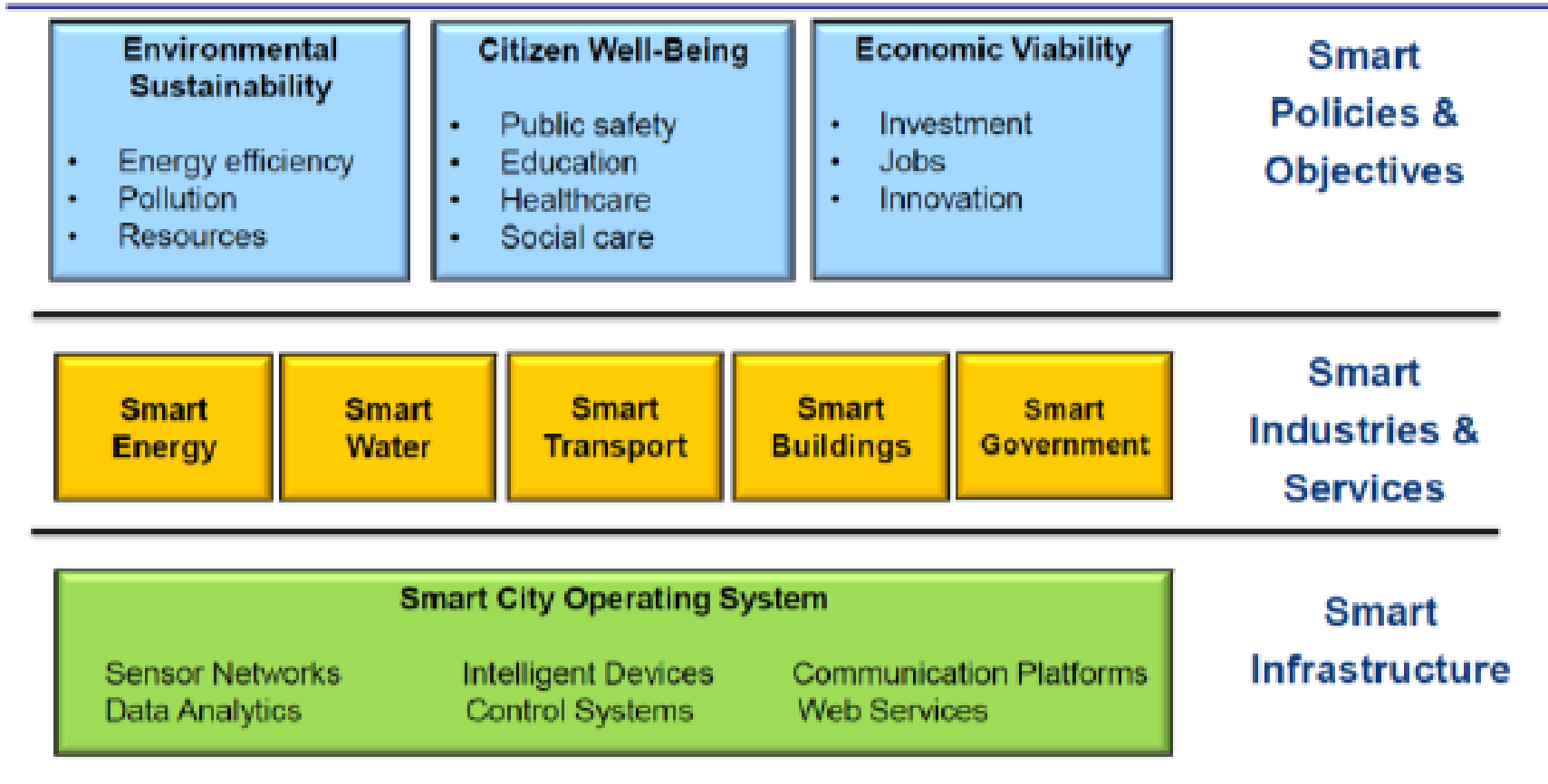


Aalto University
School of Electrical
Engineering

Innovative Lighting Solutions for Smart Cities – Potential for Creating Experiences and Solving Social Challenges

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Smart City



(Source: Navigant Research)



A?

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ENIGMA

Partners:



Cities:



ENIGMA Project

Enlightenment and Innovation Ensured through Pre-Commercial Procurement in Cities

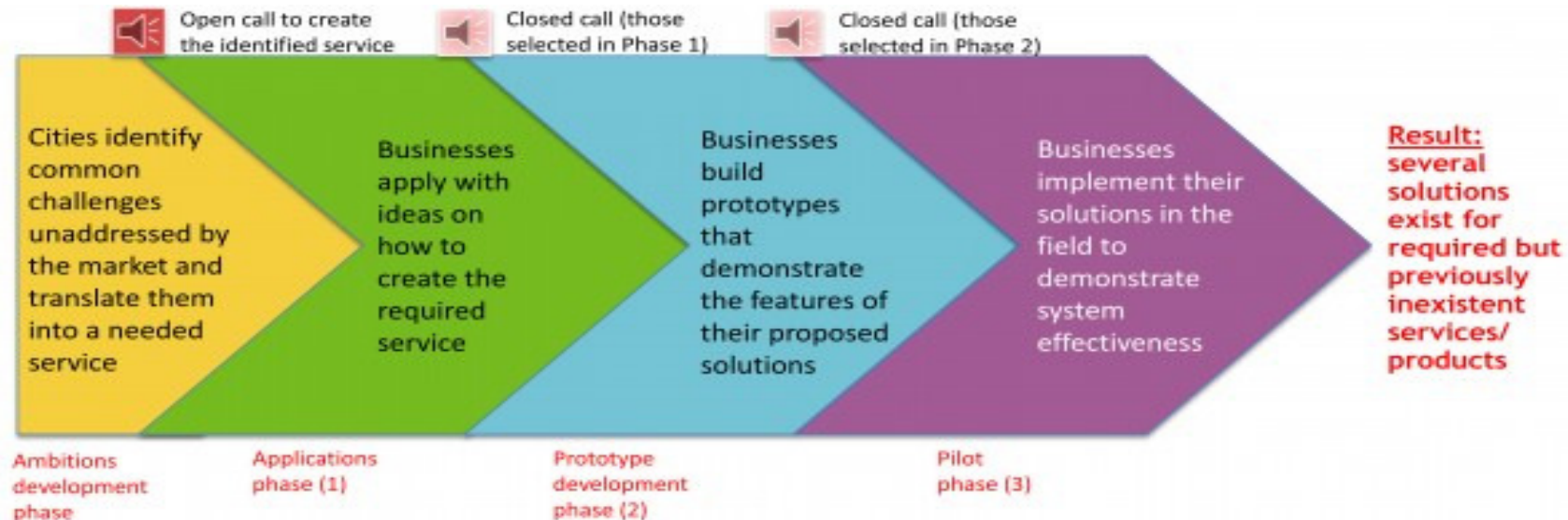
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ENIGMA - Enlightenment and Innovation Ensured through Pre-Commercial Procurement in Cities

- **5 city partners in the project will launch a joint PCP process for procuring innovative solutions**
 - Pre-commercial procurement processes in cities are compared – Best practices are identified throughout Europe
 - In public lighting systems, innovative ICT solutions offer increased energy efficiency and safety in the urban areas
 - **ENIGMA covers the whole PCP process from solution design, prototyping and development of the products**
 - Work package 1 concentrates on the cities' needs and ambitions what they want to achieve by the new ICT and public lighting solutions
 - WP 2 prepares the cities for PCP, and WP 3 prepares the actual PCP call
 - WP 4 aims at mutual learning in the process and dissemination
 - WP 5 manages the project
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ENIGMA Project

- Pre-commercial procurement (PCP) process in outdoor lighting in 5 pilot cities in the Europe
- The PCP call aims at the fulfilment of the needs and ambitions of the cities – not the exact technology directly
- To combine lighting and ICT so that the cities societal needs are addressed



Smart Cities – Challenges in Sustainability



Inviting, comfortable, safe urban space for citizens to actively use the area

Guiding and adapting lighting

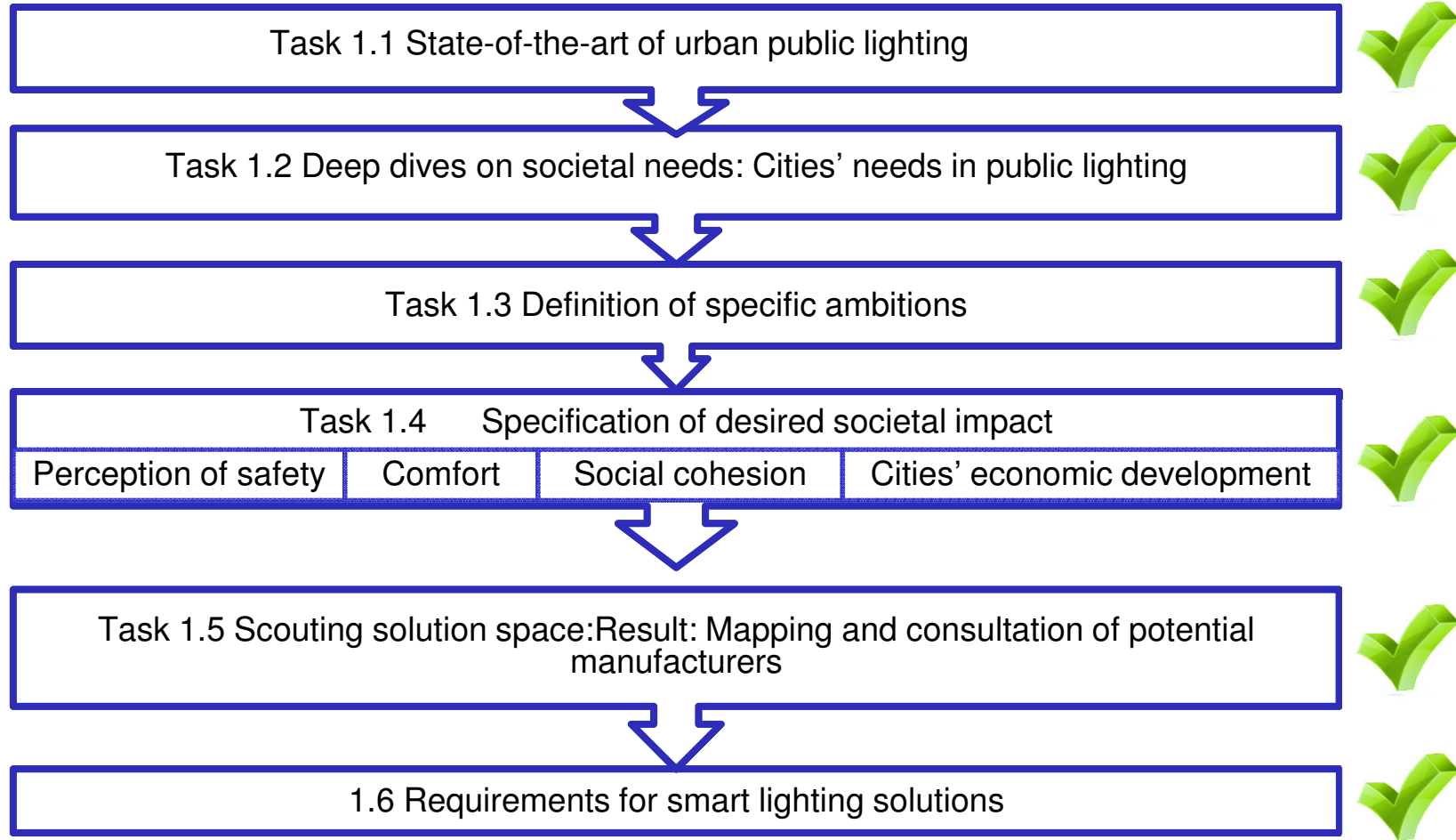
Lighting to create inviting atmosphere to entice customers

From standards to added value for the citizens

- Road lighting as an accident countermeasure
- Road lighting design guidelines in EN 13201-1...4 for roads for motorized, bicycle and pedestrian traffic
 - Enabling safe walking, biking, driving
- Potential to create added value by lighting
 - Lighting itself (aesthetics, intuitive guidance etc.)
 - Integration of lighting and other services -> SMARTNESS



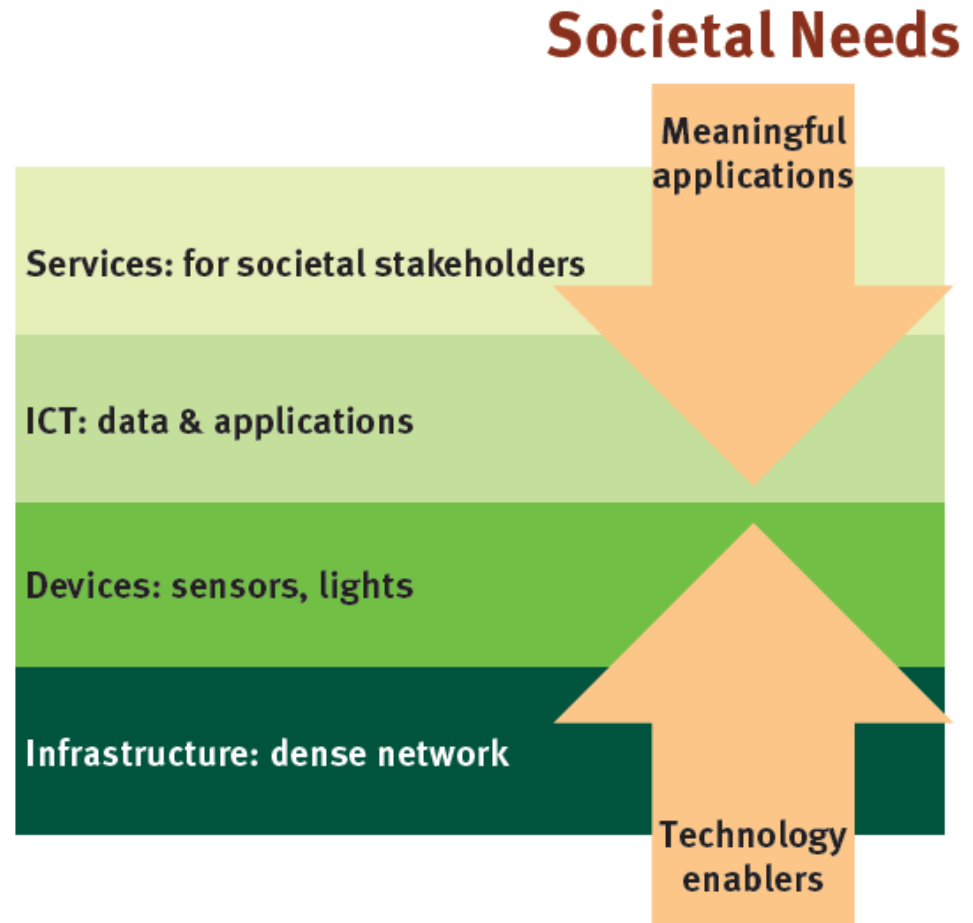
Work package 1 – Defining the needs



ENIGMA Project – Needs and ambitions

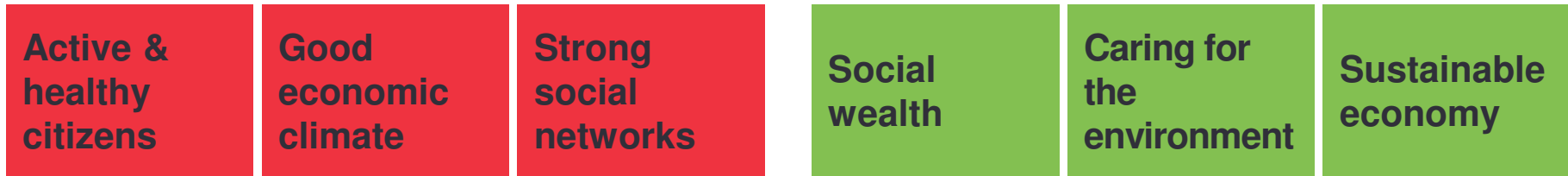
Common challenge in ENIGMA project:

To upgrade the public infrastructure and system of cities, using ICT solutions to enable cities to offer a wide range of intelligent and integrated services benefiting society and citizens and bringing the cities closer to the ambition of becoming smart cities



Specified desired societal impact – What do cities want from the urban lighting?

6 areas of societal impacts identified:



A vibrant city

A vibrant city that is enjoyable to live in with all the activities, facilities and urban environment and where economic situation is good if not thriving.

A sustainable city

A sustainable city where the environment is respected and preserved without compromising the quality of life of the citizens and the economic climate.

Specified desired societal impact – What do cities want from the urban lighting?

6 areas of societal impacts identified

Active & healthy citizens	Good economic climate	Strong social networks	Social wealth	Caring for the environment	Sustainable economy
<p>Enable diverse activities (walk, bike, star gaze)</p> <p>Informing, guiding</p> <p>Comfortable, attractive and safe outdoor environment</p> <p>Accessible for all citizens</p>	<p>Vibrant economy</p> <p>Attractive to visitors</p> <p>Make people feel welcome</p> <p>Attractive to new businesses</p> <p>Highlights city gems</p>	<p>Outdoor environment a place to be and meet others</p> <p>Enhances the identity of citizens and belonging to social network</p> <p>Social cohesion contributes to less crime</p>	<p>High quality outdoor environment for all levels of income</p> <p>Enjoyable environment with greenery and nature</p> <p>Parks and urban nature more attractive after dark</p>	<p>Achieve climate objectives</p> <p>Encourage the use of sustainable solutions e.g. in mobility and recycling</p> <p>Enjoying and preserving (urban) nature</p> <p>Avoid light pollution</p>	<p>TCO, LCC</p> <p>Sustainable economy with new businesses and business models</p> <p>Create value for citizens</p> <p>Open platform for creating applications and services to improve quality of urban life</p>

Functional requirements

Adaptable

to enable changing the lighting settings according to the varying needs of diverse users

Interactive

to enable the people to control and “play” with the light

Modifiable

to upgrade or extend the system if needed

Modular

to fit the design of the installation to specific needs and to facilitate the system maintenance

Open

to connect it to other systems and to enable other systems to connect with the lighting system

Requirements for innovative outdoor lighting system from the societal needs

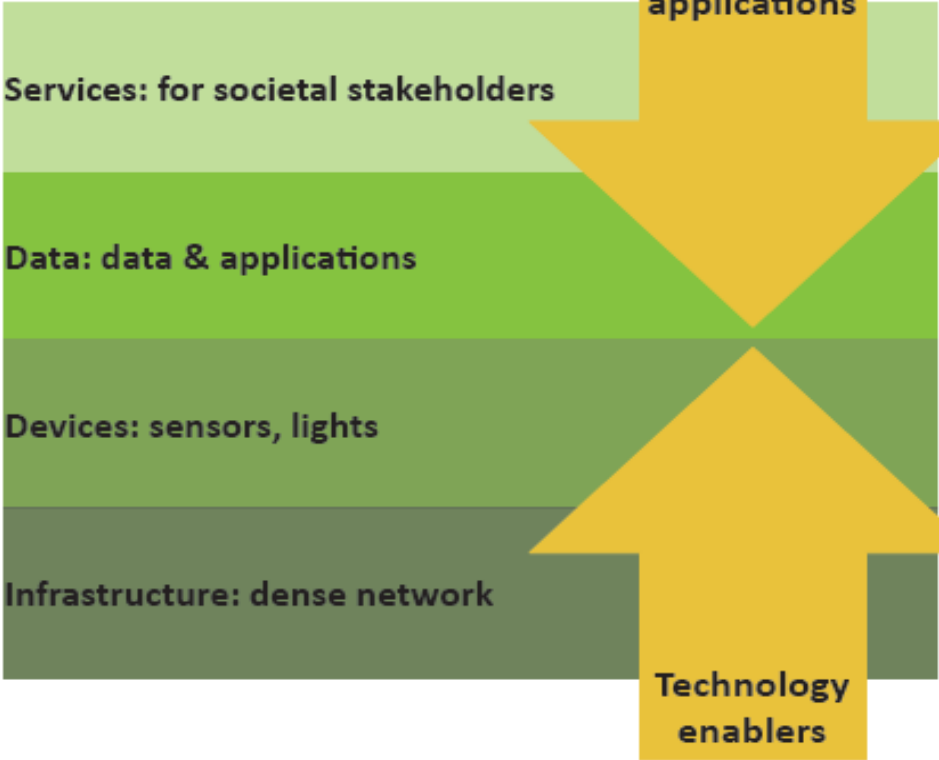
Adaptable	Interactive	Modifiable	Modular	Open
<p>Adapts to different situations (presence, amount of people, pre-set schedules, tasks and activities, season and weather)</p> <p>Right light at the right time</p> <p>Adapts colour, luminous flux, luminous intensity distribution</p>	<p>Light as a tool (to play, to inform, to communicate)</p> <p>People can choose</p> <p>Versatile interaction interfaces (smart phones, apps, buttons, detection of gestures and motion etc.)</p>	<p>System upgrading and updating allowed and enabled</p> <p>Flexible system for economic updating</p> <p>New services can be implemented</p>	<p>With relevant modules, the same system can fulfil the specific need of particular city</p> <p>Standards and interfaces enable the system modularity (building blocks)</p> <p>Design for maintenance</p> <p>Appearance of the system</p>	<p>Able to connect to other systems (e.g. traffic management)</p> <p>Light can be used for information (data on weather, traffic and events)</p> <p>Open to application and service design, open network</p>

Becoming smart cities

Deep dives on societal needs (W...)
Defining specific ambitions (W...)
Specifying desired societal impact

Looking forward to
the business
sector involvement

Innovative lighting system



Functional requirements
for
smart lighting solutions

- Adaptable
- Interactive
- Modifiable
- Modular
- Open
- Sustainable

State-of-the-art in urban public lighting (WP1.1)
Scouting solution space (WP1.5)