ENIGMA

Specifying Desired Societal Impact

Research results WP1.4 - 31 January 2014

dr.ir. Elke den Ouden & dr.ir. Rianne Valkenburg
Intelligent Lighting Institute, Eindhoven University of Technology, the Netherlands

dr. Leena Tähkämö & prof.dr. Liisa Halonen
Lighting Unit, School of Science & Technology, Aalto University, Helsinki, Finland

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Disclaimer: This report presents the views of the authors, and do not necessarily reflect the official European Commission's view on the subject.

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Introduction

The ENIGMA project

Introduction

Led by Eindhoven, ENIGMA aims to implement a joint transnational pre-commercial procurement (PCP)procedure in the field of lighting.

The project's partner cities Eindhoven, Malmö, Stavanger, Espoo and Bassano del Grappa, will define a common public lighting challenge and launch a European call for solutions. After initial research and idea screenings, possible solutions will be piloted in real life environments within each partner city.

Over the course of three years, this piloting process will be accompanied by knowledge exchanges and learning through visits between the participating municipalities and through in situ and online courses in PCP development and management.

While lighting will be ENIGMA's main theme, related issues such as energy efficiency, safety and cultural heritage will also be taken into consideration according to the specific requirements of each pilot site.

Partner cities

In the ENIGMA project the five partners cities will jointly procure a smart lighting solution and implement it in a pilot area.

Eindhoven
With a population of 220,000 inhabitants, the city of Eindhoven is the 5th largest municipality in The Netherlands. As a knowledge based and innovation oriented city, Eindhoven focuses on creating the needed support structures in the domains of innovation, labour market, technology development and business development. The municipality has a political ambition to become a Living Lab for innovative technology solutions, a smart city, dramatically improving the quality of life of its citizens.

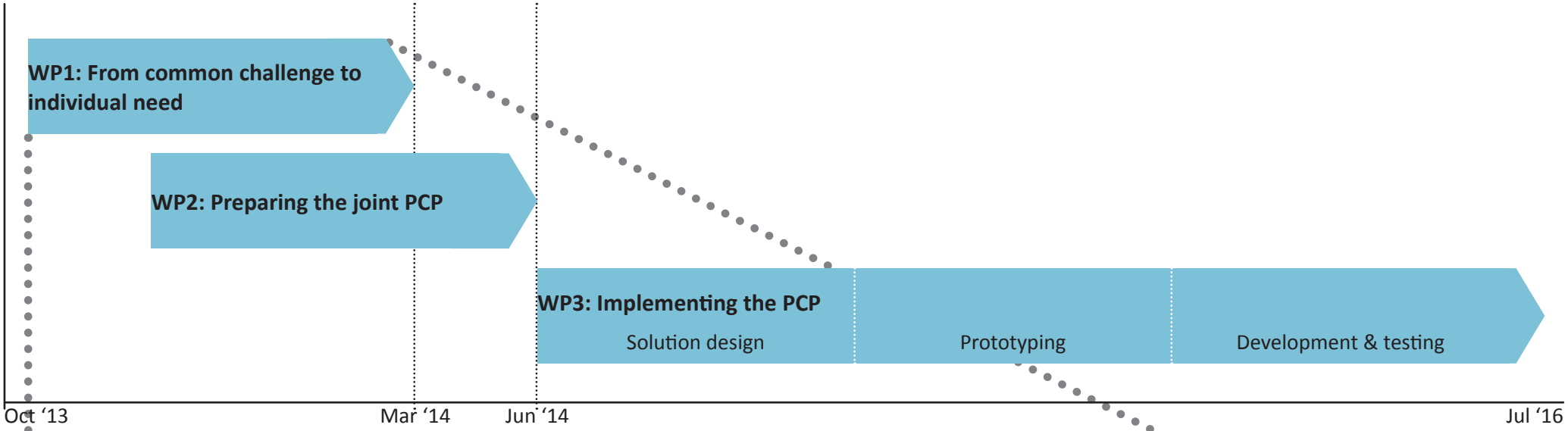
Malmö
Malmö is Sweden's third largest city and the commercial centre of southern Sweden. The municipality has had a strong focus on creating a safe, attractive and environmentally aware city, a city where the citizens feel safe using public areas. The last decade has seen Malmö consciously reinventing itself as a sustainable multi-cultural city. The local authority has given priority to activities aimed at creating a green, attractive and environmentally aware city, and has gained international recognition for its undertaken efforts.

Espoo
Located in the western part of the Helsinki Metropolitan Region and with a population of 260,000 inhabitants, Espoo is the second largest city in Finland. It has the largest concentration of science and innovation facilities in Northern Europe, belonging to the famous Otaniemi – Keilaniemi – Tapiola triangle. Espoo, together with the other cities, universities, research centres and industry in the Helsinki Region operates already as a EU Smart Region, pioneering several Europe 2020 high-level innovation developments, particularly in the field of lighting.

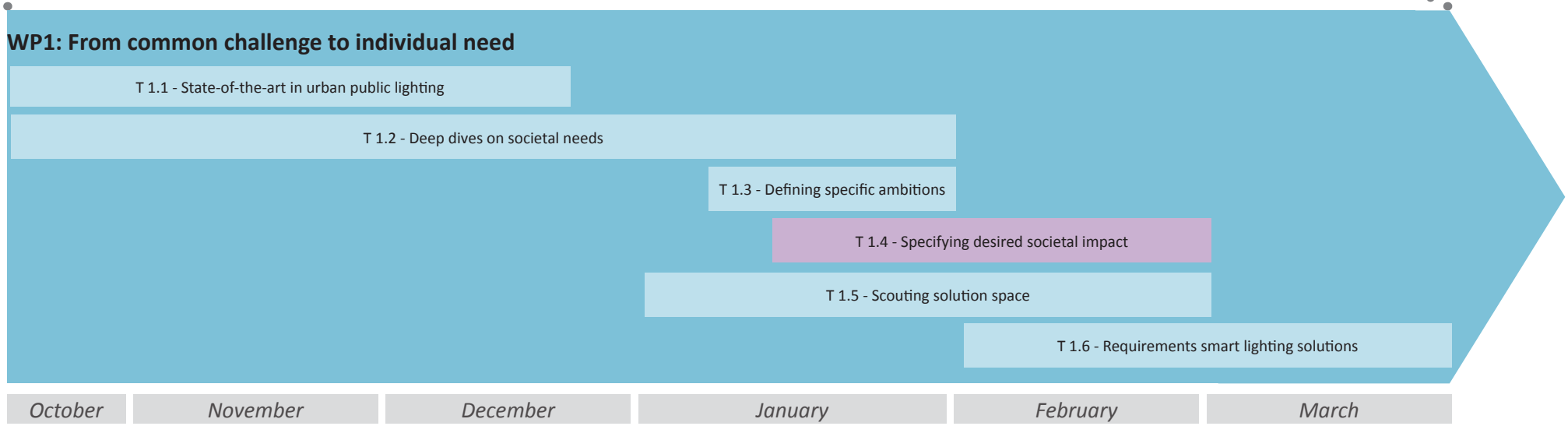
Stavanger
Located on the South West coast of Norway, the City of Stavanger and its 130.000 inhabitants represent the country's most densely populated municipality. Stavanger is the 4th largest city in Norway, known as the "Oil Capitol" since the oil industry is located here. The local authority has focus on being a healthy and sustainability city and has given priority to establish a strong green structure, where walk ways are an important part. Stavanger also underlines the importance of combining energy efficiency, urban design and public safety when it comes to upgrading of the lighting systems.

Bassano
Bassano del Grappa is a historic city belonging to the Province of Vicenza, located in the Veneto Region, in North East Italy. The management of public lighting is an increasingly important topic within the city administration, as the municipality is aiming to quickly adapt to new EU and Italian legislation in this field. Due to its cultural heritage, the city is looking to combine within its public lighting solutions energy efficiency considerations with the need to highlight its historic city centre.

Overall planning of the Pre-Commercial Procurement process of ENIGMA



Planning of WP1



Work package 1: From common challenge to individual needs

Work Package 1 starts from the defined common challenge and commences work on the definition of the state-of-the-art in innovative urban lighting solutions and the creation of a joint ambition for smart urban lighting systems, bringing together the common challenge and the 5 sets of individual needs and contexts.

This work package gathers existing experience and knowledge on societal needs and related innovation opportunities in the lighting domain from both within the partners and from other sources and use this to synthesise an ambition suitable for use across European national boundaries. This process focuses on the societal impact specification of the smart lighting solution to achieve Cities' societal ambitions.

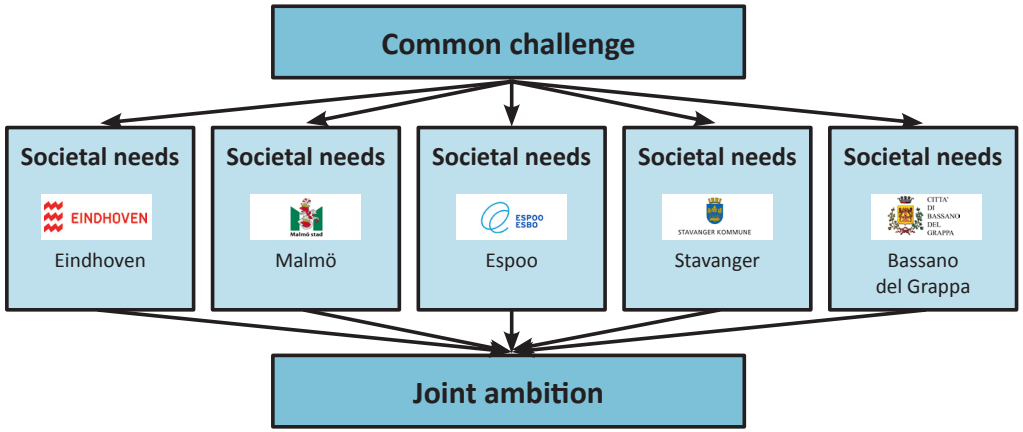
Work package 1 provides input for the preparation of the joint PCP.

Common challenge

The aim of the ENIGMA project is to procure a public lighting infrastructure as a carrier to improve societal health.

Public lighting and public infrastructure can play a significant role in achieving ambitions of cities to reach significant improvements on energy consumption, public safety and crowd control, traffic management and quality of life. Lighting is also a useful instrument in making the city an attractive place to live.

The partner cities have defined as common challenge for the joint PCP process:



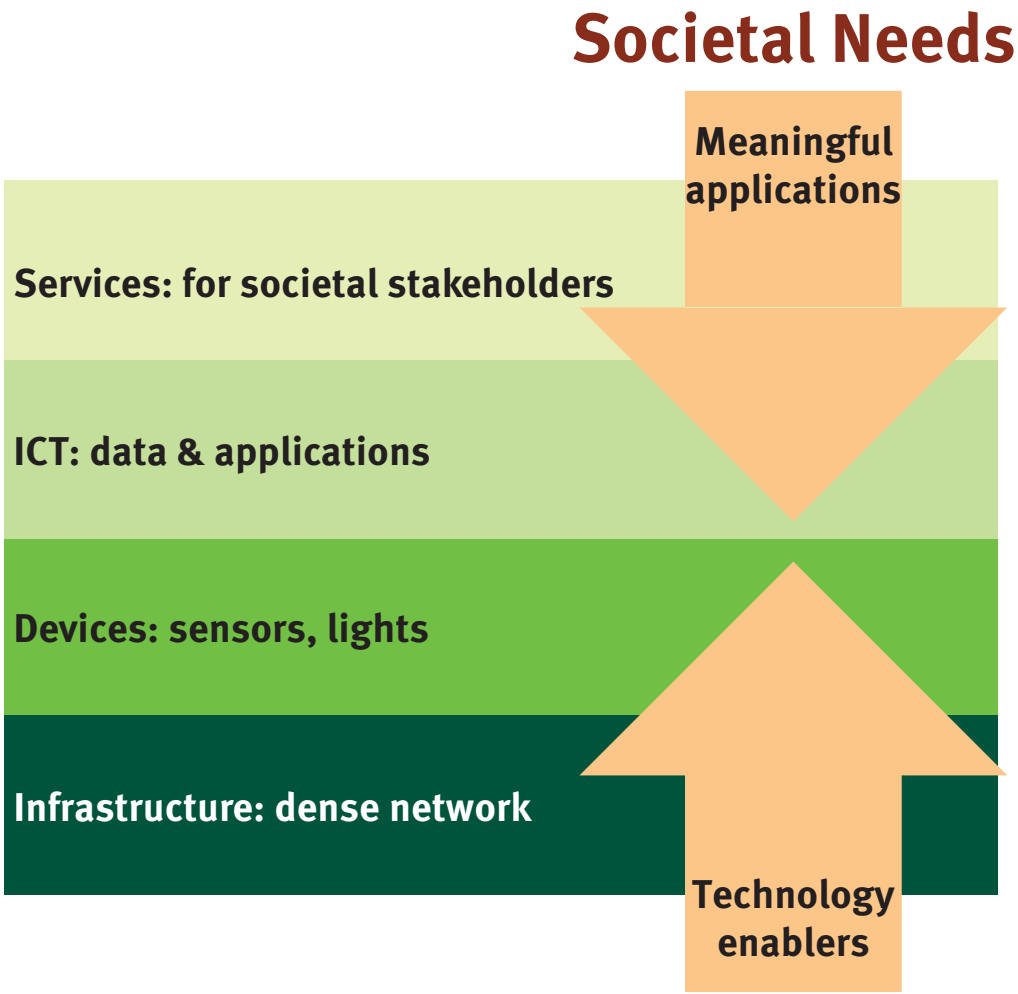
ENIGMA Common challenge
To upgrade their public lighting infrastructure and system, using ICT solutions, to enable cities to offer a wide range of intelligent and integrated services benefiting society and individual citizens and bringing the cities closer to the ambition of becoming Smart Cities.

Specifying Desired Societal Impact

To be able to communicate the goal of the ENIGMA project to market parties, the results of the Deep Dives (T1.2) and of the workshop on the common and specific strategic ambitions and societal needs (T1.3), need to be further developed into a specification of the desired societal impact of the intelligent (lighting) solution.

The results of this task (T1.4) will be used for the discussions with market parties in the scouting of the solution space (T1.5) and also forms the basis for the requirements that will be further defined in T1.6.

Intelligent lighting solutions



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Innovative lighting solutions have the potential to increase health, safety and well-being. However, to achieve these effects, new lighting solutions need to be defined so that they specifically address these societal level ambitions. Until recently procurement processes focused on buying released products from the catalogues of suppliers to achieve illumination of roads. Today, with the growing capacities of ICT and sensor technologies, lighting and the lighting infrastructure have become a key tool for urban planning, creating value and wealth for the city, attracting investment, promoting heritage, changing perceptions, bringing together new partnerships, and also just illuminating roads and paths. This transition to buying solutions that aim for societal impact require a different way of defining ambitions and specifying solutions to drive innovations into the desired directions.

Commonly practiced ways of working to specify illumination levels would not lead to the procurement of innovative solutions that radically improve the quality of life in cities.

For the ENIGMA project it is therefore important to take a wider understanding of intelligent lighting systems that include not just the different products (luminaires and lamps), but a wider notion of ICT based solutions.

Integrated lighting and ICT solutions

Public lighting and public lighting infrastructure can play a significant role in achieving ambitions of cities in making the city an attractive place to live. Technological developments include an upgrade of the public lighting infrastructure and system by connecting to ICT solutions. This enables cities to offer a wide range of intelligent and integrated services benefiting society and individual citizens and bringing cities closer to the ambition of becoming smart cities. This integrated lighting and ICT solution can best be explained by describing 4 levels of the system: infrastructure, devices, ICT and services, see also the picture on the facing page.

In this four level model, technology is considered an enabler. Technological developments create new opportunities for applications. These applications become meaningful when they address relevant societal needs. In the ENIGMA project the procurement process of an intelligent lighting system is started from societal needs in the partner cities and the selected pilot areas.

Infrastructure
The level of the infrastructure can be seen as the 'road' that enables all 'traffic'. Traditionally for public lighting this meant the underground wiring for power. Nowadays it also includes internet connectivity as well as wireless solutions. In the coming years, the infrastructure will become a dense network to enable the connection of all kinds of devices and communicate all kinds of data.

Devices
The number of devices is growing rapidly. Traditionally, devices in public lighting contain public lighting luminaries and traffic lights. This is gradually expanding with other types of sensors and actuators, either with low bandwidth, such as timers, light intensity sensors, microphones, movement sensors, fine-dust sensors or high bandwidth for example camera's, interactive displays, touch screens, and smart phones. Many devices collect or use data and are therefore connected (the internet of things).

ICT
On the ICT level the connection is made with data and software applications. The data that is collected through different devices contains e.g. time, people counting or proximity measurements, weather information, movements, energy consumption, camera data, etcetera. Mash-ups and data analytics will lead to insight in emerging patterns or correlations that can be used for various software applications.

Services
At this level meaningful services are developed that provide value for the relevant stakeholders. In urban lighting there are often different stakeholders that use the area, with different needs and wishes. The ultimate goal of urban lighting solutions is to create value for societal stakeholders by creating a healthy and liveable city. Smart lighting can offer valuable services for different stakeholders using the ICT based lighting platform.

Specifying Desired Societal Impact

To further develop the common and specific strategic ambitions of the cities and the societal needs of the pilot areas, the results of the Deep Dives are used as a basis to specify the desired societal impact of the intelligent (lighting) solution that will be procured in the ENIGMA project. From the joint ambition workshop two main themes are defined that are needed for the cities to achieve their goal of becoming smart cities: a vibrant city and a sustainable city. In this section of the report the two themes of smart cities are described in more detail. For this description the elements from the Deep Dives are used, clustered and phrased to provide a clear starting point for discussions with the market parties in the next tasks and work packages of the ENIGMA project.

A vibrant city

A sustainable city

A vibrant city

The first theme in the ambition of the ENIGMA partner cities to become smart cities is defined as becoming a vibrant city.

In a vibrant city three goals are achieved:

- Active & healthy citizens
- Good economic climate
- Strong social networks

The clustering of all societal needs and strategic ambitions is shown in the appendices.

Active & healthy citizens

Citizens are active and spend a significant amount of time outdoors in a diversity of activities. The outdoor environment is comfortable and makes it attractive to take a stroll or go for a bicycle ride, all day and all year round. Facilities in the city are easy to reach and accessible for citizens of all ages. There is a wide range of attractive experiences, catering for the different needs and interests of different people. Because of their increased activity people are more healthy and happy.

The innovative smart lighting system enables an active and healthy lifestyle. It makes the citizens feel comfortable and safe, and invites them to spend more time outside. It informs them on activities currently going on in the city and provides easy routing and guidance, so that they can participate in the activities they enjoy. The adaptable lighting system provides them with the right light at the right place. For example, when they want to go for a run, the light is brighter on the path, bit it dims when they want to enjoy the starry sky. By making walking and cycling more attractive it supports the change to more sustainable ways of transportation.

Good economic climate

The city has a vibrant economy and attract tourists and visitors, also from further away. People are invited to explore the gems of the city, which are easy accessible. The various parts of the city are vivid and make people stay longer and come back more often. The local economy thrives with commercial activities and attracts new businesses. The economy is continuously developing and new activities keep the city attractive for frequently returning visitors.

The innovative smart lighting system fosters the development of the economic climate. It makes people feel welcome. By providing information on the activities and interesting events in the city, it makes visitors stay longer and return more often. It literally highlights the gems of the city, so that people become aware of all the things the city has to offer. Because of the good business prospect new entrepreneurs are attracted to set up commercial activities in the city.

Strong social networks

The social fabric of the city is strong. People experience the outdoor environment as a place where they want to be and meet. The city provides its citizens with an identity and they are proud to of living there and belonging to the social network. The citizens experience their city to be human scaled: despite the size of the city everything is within reach and feels comfortable. The social cohesion also results in less crime and vandalism.

The innovative smart lighting system supports the social fabric in the city. It provides an inviting atmosphere for people to be and meet each other. Smart lighting solutions also provide entertaining places, for people with common interests to meet each other and socialize. For example, the lighting at a square can invite elderly to sit and relax with friends at some time of the night, but it can also allow for a dynamic playful interaction for kids to play together. By creating a diversity of experiences for different social groups, the smart lighting system ensures there is a place and time for everybody to meet others for a joint activity.

An innovative smart lighting system consisting of ICT based lighting systems and services enables the achievement of a vibrant city in various ways.

A sustainable city

The second aspect in the ambition of the ENIGMA partner cities to become smart cities is defined as becoming a sustainable city.

In a sustainable city three goals are achieved:

- Social wealth
- Caring for the environment
- Sustainable economy

The clustering of all societal needs and strategic ambitions is shown in the appendices.

Social wealth

The quality of life in the city is high, for all levels of income. This applies to facilities, e.g. housing and good education, as well as the outdoor environment. The environment is enjoyable with an abundance of nature and greenery, providing a relaxing environment. Citizens take responsibility for the environment and collaborate to keep the quality of life high. Sustainable behaviour is encouraged in various ways.

Caring for the environment

The city achieves its ambitious climate objectives and actively stimulates citizens to take care for the environment. The environment is preserved, whether it is the cultural heritage or nature and wild life. Citizens enjoy a green environment, and are motivated to choose sustainable solutions (e.g. in mobility, recycling and renewable energy).

Sustainable economy

The economy in the city is build on sustainable principles. Decisions are based on total cost of ownership: taking maintenance, energy and life cycle costs into account, as well as indirect effects on the environment and people's health. (Social) Entrepreneurship is encouraged as well as new businesses and new business models that create a sustainable economy with services that create value for citizen.

An innovative smart lighting system consisting of ICT based lighting systems and services enables the achievement of a sustainable city in various ways.

The innovative smart lighting system enables social wealth. By providing an enjoyable outdoor environment people are encouraged to spend time outside and take care of their nearby environment together. The system makes parks and nature more attractive after dark. Citizens are invited to have a more active lifestyle and take part in social activities in natural environments.

The innovative smart lighting system takes care of the environment as well. A sustainable product life cycle is achieved by applying sustainable solutions, energy saving measures and renewable and recyclable materials. It also allows for a variety of designs to fit the different environments (such as historical sites, architectural monuments, nature and parks). It also takes care of nature and wild life by avoiding light pollution and applying environmentally friendly lighting scenarios that make it possible to enjoy nature, and preserve it at the same time.

The innovative smart lighting system provides an open platform that allows for the development of various applications and services to improve quality of life in the city. It actively seeks for business models that encourage sustainable behaviour and new sustainable business with environmentally friendly solutions. It creates a platform on which attractive, yet affordable, high quality outdoor spaces can be realised. The system creates value for various stakeholders at reasonable integral costs.

Appendices

In the appendices the elements of the strategic ambitions of the cities and the societal needs for the pilot areas as defined in the Deep Dives are clustered into the two aspects that are important to become smart cities: a vibrant city and a sustainable cities. The purpose of the appendices is to keep a direct link between the description of the ENIGMA ambitions as it will be presented to the market parties and the original information as provided by the cities. This will allow project members and other stakeholders during the further development of the ENIGMA project to make use of the richness of the information collected in the Deep Dives.

A vibrant city

The strategic ambitions of the cities and societal needs for the pilot areas are clustered into three ingredients of a vibrant city:

- Active & healthy citizens
- Good economic climate
- Strong social networks

Active & healthy citizens

Stavanger wants to be an attractive, safe and sustainable city.

Espoo wants to create an inviting urban space for citizens of all ages to spend more time outside (walking, biking, staying) and feel comfortable and safe.

Espoo wants to provide efficient public transportation (rail grid, diagonal connections, trams and metro) to reduce car dependence.

Espoo wants to pay more attention to pedestrians and cyclists and provide them with safe and easy accessible walking/cycling routes.

Having a high quality living environment with a variety of functionalities (Espoo).

Having an attractive area with an identity to create pride by the users and stakeholders (Eindhoven).

Paying more attention to pedestrians and provide good visibility, safety, routing & guidance (Bassano).

Eindhoven wants to create a diversity in experiences with a coherent identity.

Bassano wants to enable sustainable mobility by providing pedestrian and cycle paths.

Eindhoven wants to facilitate mobility for all users of the public space.

Stavanger wants to become a ‘walking’ city where it is easy to reach all facilities, by public transport, by bike or by foot.

Malmö wants to provide a secure and safe city that is accessible for all citizens in all seasons (with clean streets, good transportation system).

Provide high quality lighting for different activities (e.g. strolling through the city, playing, watching the stars) (Bassano).

Having an attractive area that invites to do different activities outside (Espoo).

Having good public transport connections for all stakeholders (Espoo).

Showing the impact of innovative smart (lighting) solutions by creating a smart area that adapts to time, people, activities etc. (Malmö).

Good & well-maintained public facilities to increase the feeling of safety and make the area more attractive (Stavanger).

Having a safe place with a low risk of crime and vandalism (Malmö).

Increase the citizens health (Stavanger)

Being at ease and perceiving a safe environment that is attractive to spend more time (Malmö).

Having attractive and safe walking and cycling routes (Espoo).

Good & well-maintained public facilities to increase the feeling of safety and make the area more attractive (Stavanger).

Enjoying a clean and well-lit area all year/all day round that makes you feel welcome (Stavanger).

Having continuous and dedicated routing and guidance for all road users between areas (Eindhoven).

Easy access to the cities facilities by car, public transport, foot and bike (Bassano).

Stavanger wants to provide its citizens with attractive public spaces and buildings.

Making it easy to explore the cities gems (monuments, nature, etc.) by providing good information on location and history (Bassano).

Good economic climate

Easy access to the cities facilities by car, public transport, foot and bike (Bassano).

Making it easy to explore the cities gems (monuments, nature, etc.) by providing good information on location and history (Bassano).

Stavanger wants to provide its citizens with attractive public spaces and buildings.

Eindhoven wants to realise an identity that reflects the strengths of the city as hands-on, creative, innovative, technology and design.

Bassano wants to create a vivid city centre for tourists, residents, shop owners etc. to foster a good economic climate.

Providing an attractive area with smart & innovative solutions (Stavanger).

Good environment for business and commercial activities (such as restaurants and shops) (Bassano).

Eindhoven wants to create a diversity in experiences with a coherent identity.

Eindhoven wants to provide a pleasant atmosphere, that combines functionality and experience on a human scale as a warm welcome to the city.

Strong social networks

Having an attractive place that invites to stay and meet others to explore entertaining activities (Malmö).

Meeting and socializing in a relaxing environment (Stavanger).

Perceive a good and coherent atmosphere in the area by creating the appropriate experience (Eindhoven).

Perceiving an inviting atmosphere in the evening by having the appropriate experience (Eindhoven).

Having good and affordable indoor and outdoor spaces (Espoo).

Eindhoven wants to provide a pleasant atmosphere, that combines functionality and experience on a human scale as a warm welcome to the city.

Having an attractive area with an identity to create pride by the users and stakeholders (Eindhoven).

Having a safe place with a low risk of crime and vandalism (Malmö).

Malmö wants to provide a good environment for children to enable social cohesion through good education and pleasant outdoor environment where people like to be and meet.

A sustainable city

The strategic ambitions of the cities and societal needs for the pilot areas are clustered into three ingredients of a sustainable city:

- Social wealth
- Caring for the environment
- Sustainable economy

Social wealth

Malmö wants to provide a good environment for children to enable social cohesion through good education and pleasant outdoor environment where people like to be and meet.

Espoo wants to provide high quality and affordable indoor and outdoor spaces for housing and business.

Bassano wants to create a more homogeneous city with an equal level of quality of life throughout the city.

Bassano wants to improve collaboration with local, regional and national stakeholders to create value for them.

Having an enjoyable environment that helps to diffuse stress from school and relax (Malmö).

Enjoying a green environment (Espoo).

Espoo aims to provide connected green areas through the city where citizens can enjoy the restorative quality of nature.

Stavanger wants to be an attractive, safe and sustainable city.

Caring for the environment

Malmö aims to provide a sustainable city by using 100% renewable energy and citizens taking responsibility for their environment.

Stavanger wants to be an attractive, safe and sustainable city.

Eindhoven wants to take responsibility for the environment by using renewable energy and improving sustainability.

Stavanger wants to use materials that can be recycled.

Enjoying a green environment (Espoo).

Bassano wants to create flexible & adaptive smart (lighting) services to modernise the centre while doing justice to its historical character.

Embracing wild life and taking care of nature as a unique place in the city (Stavanger).

Espoo aims to provide connected green areas through the city where citizens can enjoy the restorative quality of nature.

Balancing an undisturbed, preserved nature with the ability to enjoy nature, also as a learning experience (Stavanger).

Improve sustainability to reach climate objectives (Eindhoven).

Sustainable economy

Right and correct lighting furniture to respect the city characteristics and landscape (Bassano).

Having a sustainable place, with low energy use and low maintenance cost (Malmö).

Having an affordable and sustainable lighting for the area with low life-cycle costs (Espoo).

Achieving sustainability with low energy costs and low maintenance cost (Stavanger).

Achieving sustainable lighting: energy efficiency, cost efficiency and the right lighting in the right place (Bassano).

Espoo wants to provide efficient public transportation (rail grid, diagonal connections, trams and metro) to reduce car dependence.

Having a sustainable place, with low energy use and low maintenance cost (Malmö).

Having an affordable and sustainable lighting for the area with low life-cycle costs (Espoo).

Achieving sustainability with low energy costs and low maintenance cost (Stavanger).

Achieving sustainable lighting: energy efficiency, cost efficiency and the right lighting in the right place (Bassano).

Stavanger wants to apply smart & innovative solutions to create good experiences for its citizens.

Eindhoven wants to provide an open and flexible system to facilitate continuous innovation, driven by societal needs (including open connectivity of the infrastructure, open access of devices, open data for new service design, and open knowledge on societal impact).

Reduce bureaucracy and more efficient and scientifically based decision making processes (Bassano).

Bassano wants more sustainable solutions to reduce energy use & integral costs.

Malmö takes a lead role as a transforming actor to build a sustainable city by (social) entrepreneurship.

Bassano wants to improve its internal/municipal processes to become efficient and have a more entrepreneurial way of working.

Having good and affordable indoor and outdoor spaces (Espoo).

This report presents the results of the research into the Desired Societal Impact carried out as part of the ENIGMA FP7 Pre-Commercial Procurement project (Work package 1, task 1.4). The research was done by the Intelligent Lighting Institute of the Eindhoven University of Technology and the Lighting Unit of the Aalto University, both partners in the ENIGMA project.

The outcome of the Deep Dives and Joint Ambition workshop that were held with the five partner cities of the ENIGMA project have been further defined into the Desired Societal Impact. The results will be used to communicate with market parties in the solution scouting activities, as well as for the preparation of the pre-commercial procurement tender that will be issued as part of the ENIGMA project.

For more information on the ENIGMA project, please visit: www.enigma-project.eu

Eindhoven, 31 Januari 2014

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