



Plus

Review

Public Lighting Strategies for Sustainable Urban Spaces

EXPERIENCES IN SUSTAINABLE LIGHTING

Eindhoven | Bassano del Grappa
Birmingham | Burgos | Iasi | Leipzig
Lyon | Métropole Nice Côte d'Azur
Patras | Sofia | Tallinn | and more...

Key issues in urban lighting

ENERGY EFFICIENCY | LIGHT POLLUTION | ENHANCING THE URBAN ENVIRONMENT...



European Union

European Regional Development Fund



INTERREG IVC

INNOVATION & ENVIRONMENT
REGIONS OF EUROPE SHARING SOLUTIONS





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to December 2012

PLUS (Public Lighting Strategies for Sustainable Urban Spaces), financed by the EU's INTERREG IVC programme, capitalizes on existing urban lighting best practices on energy efficiency in European cities.

It aims to offer a set of recommendations leading to the improvement of cities' lighting strategies and action plans.

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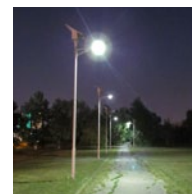
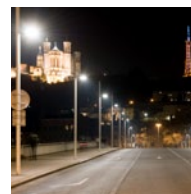
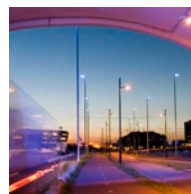
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“PLUS at the speed of light”

EDITORIAL

After a quick start in January 2011, we now look back on a very intensive period in which we not only visited each other's cities but in which we also entered into the depths of urban lighting. A year during which we got to know each other well, professionally as well as on an inspiring personal level.

The good thing about an international European project like PLUS, is that you learn a lot more about motives and drivers behind the daily routines in the lighting field. Although there is a great diversity in approaches in the various European regions, partly culturally defined, all PLUS partner cities experience a similar struggle implementing innovation in their lighting schemes.

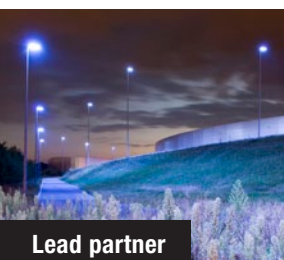
With new technologies developing at the speed of light, cities now have a wider choice than ever in re-developing their lighting strategies. A whole new range of monitoring and control tools that even go beyond lighting itself are now within reach.

New strategies are also needed. Strategies that include more than just providing adequate lighting. The future requires much more focused lighting that is not only based on the place, but which also takes into account time, usages and activities. In short the best we can offer in all possible circumstances.

As illustrated in this review, the PLUS consortium has collected many valuable experiences since the beginning of the project and the 11 Deep Dives organized within it. The PLUS partnership now faces the task of compressing all this into a mainstreaming guide that will be valid not only for our cities but will also be of value for each municipality that asks itself: “what's next in lighting the city”.

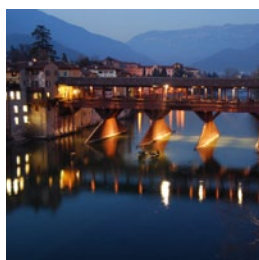
Councillor Mary-Ann Schreurs
City of Eindhoven

PLUS partners



Lead partner

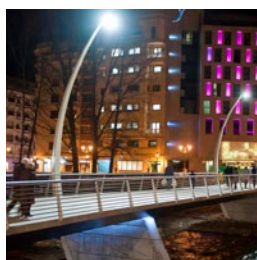
Eindhoven
The Netherlands



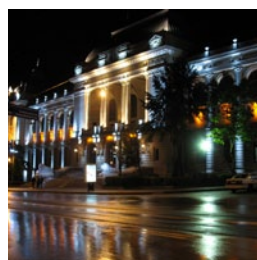
Bassano del Grappa
Italy



Birmingham
U.K.



Burgos
Spain



Iasi
Romania



Leipzig
Germany



“The PLUS project reinforces one of the goals that LUCI aims for – promoting sustainable lighting”

EDITORIAL

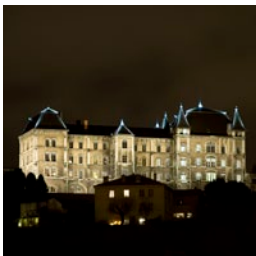
With its objective to rationalize energy consumption related to urban lighting, the PLUS project reinforces one of the goals that LUCI aims for in promoting sustainable lighting. It also comes in line with the principles of the LUCI Charter on Urban Lighting, which promotes the adoption of an integrated public lighting strategy as essential for the balanced and sustainable growth of a city.

We are pleased to see that the LUCI Charter has been used as a reference document in the framework of this project, for cities to evaluate and assess their urban lighting policies. It also constitutes the backbone of this PLUS Review, which brings together some of the most innovative and exemplary practices in urban lighting in Europe, and illustrates the understanding we have of comprehensive and integrated lighting strategies.

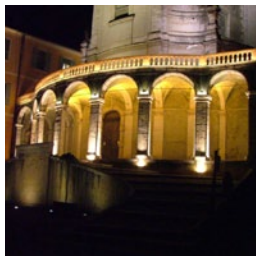
With this publication, LUCI pursues its communication task within PLUS, by collecting news, information, and best practices identified within the PLUS project – and beyond –, and disseminating it to cities and lighting professionals worldwide. In this way, LUCI seeks to offer a real added value to the project, with its capacity to raise awareness of decision makers at municipal level, ensure the durability of PLUS outputs, and also liaise with other projects at municipal, European or even international level.

In conclusion, and after more than 18 months of work within the PLUS project, I would like to congratulate all the partners for their involvement, and especially the lead partner Eindhoven whose work and dedication has made this project constructive and fruitful for all.

Councillor Allan Stewart
President of LUCI
Glasgow City Council



Lyon
France



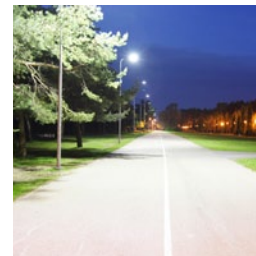
Nice
France



Patras
Greece



Sofia
Bulgaria



Tallinn
Estonia



Communication partner
LUCI Association



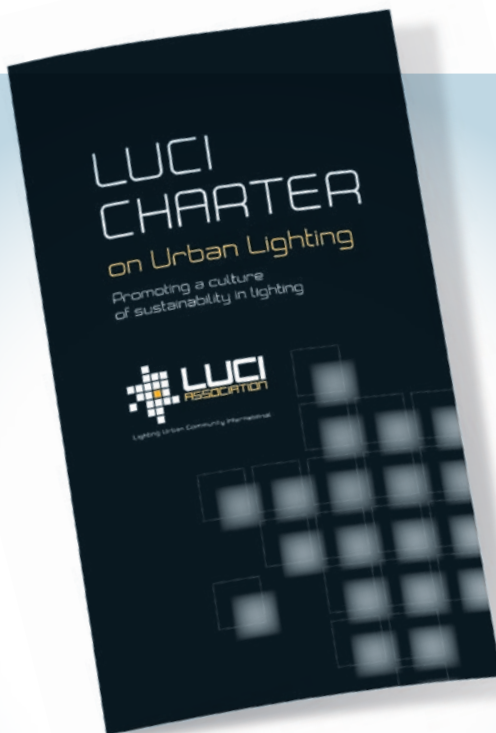
Three questions for Rik van Stiphout, PLUS Overall Project Manager, who is also the Programme Manager Lighting for the City of Eindhoven, the PLUS lead partner:

What are the goals of the PLUS project?

PLUS aims to make a significant contribution to decreasing energy use and rationalizing energy consumption related to public lighting. Its main objective is to come up with new viable solutions to different environmental challenges faced by each partner city in the field of lighting.

How will this be accomplished?

PLUS has become a learning centre and network point for all cities. Matching and accelerating existing knowledge in this way will result in high quality lighting strategies not just for partner cities but for cities worldwide.



The guiding framework of PLUS: the LUCI Charter on Urban Lighting

The product of contributions from over 40 cities around the world, the LUCI Charter on Urban Lighting aims to give a clear view of the issues that should be taken into account by sustainable lighting strategies.

It addresses challenges common to all: energy efficiency, maintenance, recycling and light pollution, as well as the cultural and social dimensions of lighting, and the use of light to improve the quality of life.

The Charter promotes the idea that a public lighting strategy that is integrated into the overall urban development policy is essential for

the balanced and sustainable growth of a city – one of the core principles behind the PLUS project.

Signed by over 30 towns and cities worldwide, the Charter is also the principal reference document for PLUS, playing an essential role in the Deep Dive process. It forms the basis of the project partner cities' self-assessment reports, in which they evaluate and assess their urban lighting policies, and will also be a frame of reference for their future lighting strategies and action plans.

On concrete terms, what does the project imply?

Every partner city hosts a “Deep Dive” session, asking local experts to define their best practices and demonstrating how things work best from their perspective. Successes and shortcomings are identified and compared to other partners’ experiences.

The resulting set of recommendations from this working method will lead to improved public lighting strategies and action plans for participating cities and regions.

PLUS aims to set an example regarding both methodology and content.



PLUS activities



Workshop

PLUS is a centre of learning. Through field visits (Deep Dives), training sessions and the mobilisation of local stakeholders (Regional Forums), cities develop new learning methods and build new partnerships. The innovative methodologies established within the PLUS project contribute to creating a permanent learning and training centre on urban lighting in each city.



Showcase

PLUS not only promotes best practices and innovative experiences in sustainable urban lighting, it also finds the right way to transfer this knowledge. The PLUS Showcase is an interactive tool that collects, presents and disseminates these best practices to raise awareness within and beyond the PLUS partner cities.



Forum

Through its innovative communication tools, PLUS constitutes a space for discussion and exchange of information on sustainable urban lighting. With LUCI (Lighting Urban Community International), the project also goes beyond the partnership to find inspiration in cities world-wide, making PLUS an international forum of discussion.

PLUS in action



"Meeting the PLUS project representatives when they were in Birmingham last year confirmed to me that we are all facing similar challenges across the world and the opportunity to exchange ideas and information is key to the Lighting Profession improving standards and delivering energy saving solutions."

Nigel Parry, Institution of Lighting Professionals, U.K.



"The PLUS methodology allows for maximum participation from amongst a wide variety of people. It also requires a lot of preparation both on the part of the hosts and the visitors."

Sevdalina Voynova, Director of Programmes at the Sofia Development Association

"PLUS has become a learning centre and network point on sustainable lighting for cities. In each of the 11 "Deep Dive" site visits, we have discovered new approaches and identified good practices."

Annemarie Totté, PLUS Project Manager, City of Eindhoven



"When we meet, everyone speaks the same language. We know what is expected and what we should deliver."

Heike Besier, Deputy Leader Section Public Space Design, City of Leipzig



Deep Dive calendar



► 24 - 25 May 2011
Deep Dive, Lyon



► 7 - 8 September 2011
Deep Dive, Nice



► 19 - 20 September 2011
Deep Dive, Patras



► 6 - 7 October 2011
Deep Dive, Iasi



► 27 - 28 October 2011
Deep Dive, Bassano del Grappa



"The PLUS Deep Dive was a really important experience for our city. We had the possibility to exchange views with other municipalities at the forefront of public lighting which gave us precious advice. It is really helpful to start our journey driven by partners with such a level of experience and competence."

Andrea Zonta, City Councillor in charge of Sustainability and Mobility, City of Bassano del Grappa



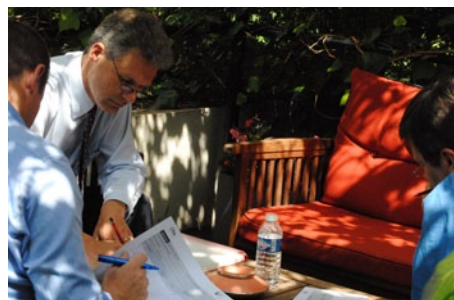
"The PLUS project not only stimulates discussion within the partnership through the communication tools and best practice database developed, it also disseminates the innovative experiences identified to cities worldwide, and contributes to raising awareness on sustainable lighting."

Alexandre Colombani, General Manager, LUCI



"You listen to other people, you challenge and you contribute. All the teams work hard to prepare and so we learn a lot."

Jean-Michel Piecuck, Manager of Public Lighting, Métropole Nice Côte d'Azur



"The PLUS approach helps cities improve themselves and saves time. It mobilises host city and visiting experts to work together, with traditional and non-traditional methods, to produce quality results."

Nicolaos Kontinakis, Environmental & Energy Projects Development Direction, Greece



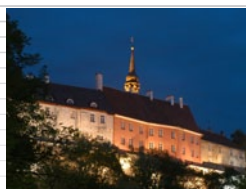
► 7 - 8 November 2011
Deep Dive, Birmingham



► 16 - 17 January 2012
Deep Dive, Leipzig



► 27 - 28 February 2012
Deep Dive, Sofia



► 12 - 13 December 2011
Deep Dive, Tallinn



► 8 - 9 February 2012
Deep Dive, Burgos



► 15 - 16 March 2012
Deep Dive and LUCI CUM Eindhoven



Optimising energy consumption

The lighting of public space accounts for 60 % of public energy use in an average European city.

Optimising the energy consumption of urban lighting can significantly contribute to the reduction of municipalities' CO₂ emissions. A variety of approaches have been identified within the PLUS project, from implementing new intelligent systems, to switching to new energy efficient technologies. The cities of Leipzig, Lyon and Iasi have all implemented projects that not only successfully address this issue from different perspectives, but also improve the quality of lighting in the city...

LED lighting for the largest public square in Europe

The largest public square in Europe, the Place Bellecour in Lyon (France) just got a lighting facelift - the square is now entirely lit with LED technology.

Twelve masts equipped with six lanterns of forty eight 120 W LEDs now provide lighting at an average of 15 lux. The entire installation is dimmed to 50 % between midnight and 5 a.m. "Increasing the energy efficiency of our public lighting network is naturally one of our top priorities. We

have therefore been using LEDs quite a bit in decorative and architectural lighting as well as in smaller pedestrian urban spaces. The renewal of the Place Bellecour was the opportunity to implement this technology on a much larger scale," explains Antoine Bouchet, Director of Public Lighting in Lyon.

The initiative, implemented in November 2011 by the Public Lighting Department of the City of Lyon, will lead to savings of 133 000 kWh per year!

The initiative will lead to savings of 133 000 kWh per year



While satisfied with the outcome of these experiments, A. Bouchet considers that LEDs are still not adapted to all situations:

"Considering their characteristics and their performance, LEDs undoubtedly have a bright future in public lighting. However, investments in this technology - which is still in a phase of rapid evolution - should focus on installations where the specificities of LEDs make a real difference in terms of energy efficiency and maintenance costs. It is the case for architectural lighting, the lighting of fountains, and more generally each time a good control of the lighting flux is essential."



Mercury-free Iasi

Mercury vapour lamps are a still common street lighting source in many cities due to their initial comparative energy efficiency. However, they are now being phased out in many parts of the world as a result of their toxic mercury content.

With a large number of these lamps still existing in the average European city, the public lighting community as a whole, has a long way to go before it is ready to face a ban in 2015.

The City of Iasi, a major city in Romania with over 350 000 inhabitants and over

17 337 luminaires on 15 959 lighting poles has taken a major step forward, having already replaced all its mercury lamps!

This was done through a contract, beginning in 2005, with the city's external service providers, SC Luxten Lighting Co. S.A. and S.C. Flash Lighting Services S.A. "Energy legislation in Romania provides for the reduction of energy consumption and the reduction of emissions of greenhouse gases such as CO₂. Through this replacement programme, Iasi has now reduced its energy consumption by up to 25 % and fulfils all the technical lighting requirements of national and international standards," says Catalin Bejan, Project Manager at Iasi City Hall.



Leipzig: an integrated approach to reducing energy consumption

The City of Leipzig (Germany) recently implemented a new lighting project that optimises energy consumption and improves lighting quality in the city centre. Lars Loebner, Principle Planner Public Space Design at the City Planning Office of Leipzig, tells us more about this award-winning project...

What was the context of the project?

In 2009, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety offered an award for the discovery of ideas and concepts on "Energy Efficient Public Lighting". As we were interested in renewing the lighting for the city centre, we developed some solutions and participated with our proposal. We were awarded the 3rd prize with our concept on "Intelligent City Light", which gave us the possibility to receive financial support from the Federal Ministry for 40 % of the realisation costs of this project.

What were the principle objectives for the lighting of the city centre?

We had multiple objectives for the new lighting. Not only did we want to optimize the energy consumption, it was also important for us to improve the lighting quality in the city centre while simultaneously maintaining the city's historical luminaires.

How did you do this?

The project consisted of two different phases. In spring 2011, we first started to retrofit 360 historical "Schinkelleuchten" type lamps in the inner city centre with LED technology. The new lamps emit 2700K warm white light with a colour rendering index of Ra 86 and efficiency of 72lm/W. In this way, we managed to preserve the

historical luminaires in the city centre by increasing their energy efficiency. They also have covers and reflectors to avoid glare. This retrofit project was a joint initiative between the City of Leipzig and the Leipzig University of Applied Sciences.

The second phase of the project in 2012 will replace the luminaires and lamps along the Inner Ring Road encircling the city centre. The new metal halide lamps produce white light (4200K white) with a colour rendering index of Ra 85 and efficiency of 90lm/W.

What are the expected impacts?

With this project as a whole, we expect to lower the energy costs by €38000 per year and to reduce CO₂ emissions by 162 tons per year. The use of LEDs and CDOs results in better lighting quality by changing orange light to a warm white light. The retrofitting of historical lanterns in the city centre will save energy by 74%, and has already reduced blinding and obtrusive light, thereby enhancing the comfort of citizens. By reducing the road lighting to minimal standards around the inner ring road, a subtle and finely adjusted illumination of the buildings surrounding the inner ring becomes possible with lower energy consumption. Intelligent control of the lighting intensity based on traffic flow will result in extra savings in energy consumption of about 10%. The project payback period will be 10.2 years.

The retrofitting of historical lanterns in the city centre will save energy by 74 %

IDENTITY CHIP

Location: Leipzig (Germany)
Population: 524 000

Stakeholders

Project director: Hartmut Erdmann and Rainer Barth, Department for Public Lighting, City of Leipzig

Lighting design:

Project 1: Augsburg Lichtarchitekten Leipzig
Project 2: Rainer Barth, City of Leipzig, Department for Public Lighting

Manufacturers:

Project 1: Schreder GmbH
Project 2: Braun Schaltgeräte und Service Berlin

Installation: Department for Public Lighting, City of Leipzig

Maintenance: Department for Public Lighting, City of Leipzig

Implementation

Project launch date: 1 January 2011

Duration of the project: 7 months

Inauguration date: 30 September 2011

Technical details

Luminaires: Citea Maxi and Schinkelleuchten

Lamps: ceramic metal halide lamps and LEDs

Power (watts): 72 600 W

Energy consumption: 235 390 KWh / year

Estimated life expectancy: 20 - 25 years

Budget

Running cost: €37 662

Maintenance cost: €16 500 per year

Total cost: €53 912

Minimizing the environmental footprint

How can cities ensure that their urban lighting system is sustainable and has a minimum negative impact on the environment? Taking into account the life cycles of all the materials used in the street lighting system, from their production, to their disposal, and potential re-use, is essential. The cities of Lyon, Tilburg, and Sant Fost de Campsentelles have all taken innovative steps to reduce the operational carbon footprint of their urban lighting systems...



Cradle-to-cradle lighting masts for Tilburg

When it designed a new lighting system for its "City Ring" – a ring around the city centre consisting of a collection of specific urban furniture elements (pavement, lighting poles, vegetation, etc.) – based on the design of the ring as a "lounge" area as well as a traffic route, the City of Tilburg (The Netherlands) ensured that the new lighting system would have a minimal environmental footprint.

The new lighting for the City Ring includes lighting masts with specially developed disc-shaped luminaires made out of recyclable aluminium that direct the light where it is needed and limit light pollution. *"The City of Tilburg was searching for an innovative concept to add a new dimension to urban lighting and wanted to combine art and functionality with a minimal environmental impact,"* explains Jos van Groenewoud, Programme Manager Policy and Maintenance in Tilburg.

Indeed, one of this project's most unique points is that it uses carbon neutral aluminium lighting masts from Sapa which are cradle-to-cradle certified.

A cradle-to-cradle certification ensures that when designing for the technological cycle to which an aluminium lighting mast belongs, all components that are made of different materials can be easily separated at the end of life.

Thus, when the project's lighting masts are at the end of their life span, they can be returned to the factory of the manufacturer where their materials will be used in another product, thus creating a sustainable cradle-to-cradle cycle.



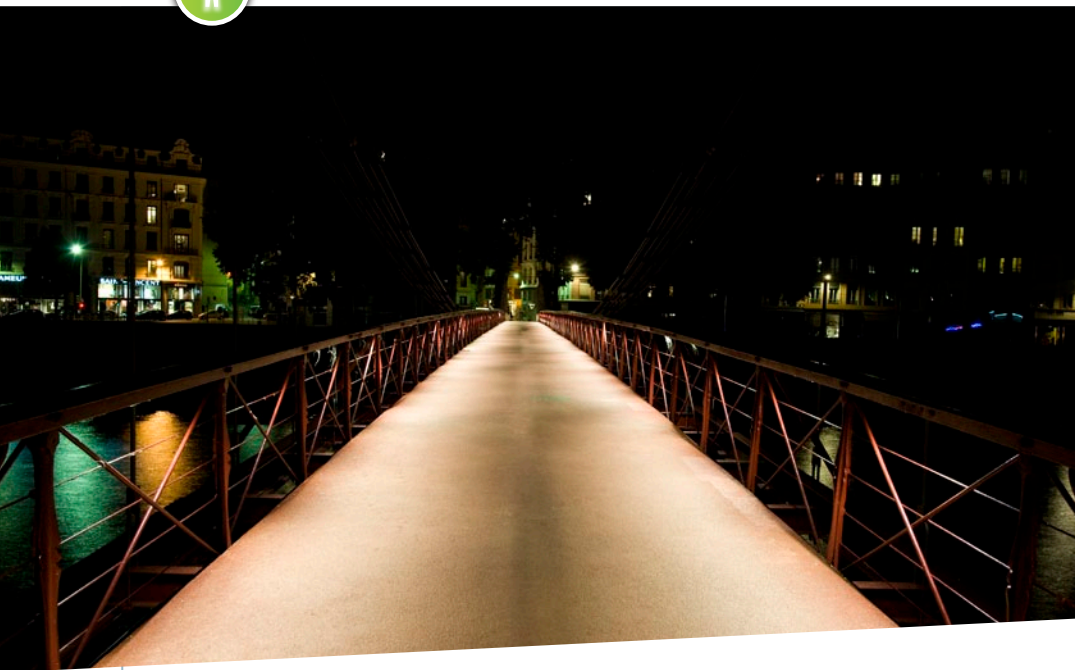
Solar power for urban lighting: a green alternative

Sant Fost de Campsentelles, a town in southern Spain with a population of less than 10000 inhabitants that has 80% of its municipal area occupied by protected forests, has a street lighting system that runs entirely on renewable energy.

The town, which secured public-private financing as part of a wider sustainable urban development project, has built a solar power plant with 8000m² of panels, 765kWp of output, and the capacity to generate 900000kWh/year of power that

will be sold to the local electric utility to power its renewed lighting system which is designed by Citelum. *"It was necessary to immediately replace our obsolete and inefficient lighting in order to ensure compliance with the safety regulations and new standards set for reducing light pollution. This is a win-win solution for the planet and the city's budget,"* declares Francesc Martinez, City Manager of Sant Fost. The town saves 63 tons of CO₂/year as a result of its use of green energy for public lighting!





Lyon: optimising its lighting operating system

The City of Lyon's second lighting master plan, which seeks to integrate new technical possibilities that increase the efficiency of the public lighting system as a whole, focuses on how residents make use of the various public spaces of the city.

"Lighting without counting the cost, not only in terms of finances but also in terms of the environment, is no longer an acceptable option. We wanted to explore the various ways in which the lighting of the city can be better adapted to the needs of the people while simultaneously optimising the operational efficiency of the lighting schedule," explains Frédéric Durand, Manager of the Lyon Lighting Master Plan.

Evolve and adapt the urban lighting to the rhythms of the city

Under the framework of the concept of temporality, the lighting department thus seeks to evolve and adapt the urban lighting to the rhythms of the city by using techniques such as presence detection and other innovative lighting projects to better manage lighting operating times.

Passerelle St Vincent

The Passerelle St Vincent, a pedestrian bridge crossing the River Saone, has seen its obsolete lighting replaced by new LEDs accompanied by presence detectors. The luminaires, which are integrated into

the bridge's railings, are invisible by day. Every evening, from 10:30 p.m. onwards, the lighting department turns down the strength of the lighting to 10% of its full capacity. However, as soon as someone steps onto the bridge, the lighting strength immediately goes from 10% to 100%. The use of presence detection technology assures that the bridge's lighting is on only when it is required, and its operation is much more efficient.

Square des Droits des Enfants

In order to raise awareness on saving energy with a humorous touch, an innovative project has been implemented in a children's park in one of the residential districts of Lyon. A switch has been put in place next to the park gate to enable residents to turn on the lights of the park as they enter, and turn them off as they leave. The garden's three spherical luminaires have also been replaced by three 80 W LED luminaires which are turned off when the park is not in use, with the switch at the entrance triggering the light to 70%. By drawing on people's reflexes to switch off their lamps when leaving a place, the city thus includes inhabitants in its efforts to save energy and increase operational efficiency.



IDENTITY CHIP

Location : Lyon (France)
Population: 480 778

Stakeholders

Contracting authority:

City of Lyon – Public Lighting Dept.

Lighting design:

Project 1: City of Lyon Public Lighting Dept.

Project 2: City of Lyon Public Lighting Dept.

Manufacturers:

Project 1: LEC Lyon

Project 2: Philips Lighting

Installation: City of Lyon – Public Lighting Dept.

Maintenance: City of Lyon – Public Lighting Dept.

Implementation

Date of Realisation

Project 1: 2011

Project 2: 2011

Technical details

Luminaires:

Project 1: 102 linear projectors

Project 2: customized luminaires

Lamps:

Project 1: 6 LEDs of 3 W

Project 2: 3 LED luminaires of 80 W

Power (watts):

Project 1: 1800 W (full capacity) 180 W (10%)

Project 2: 170 W

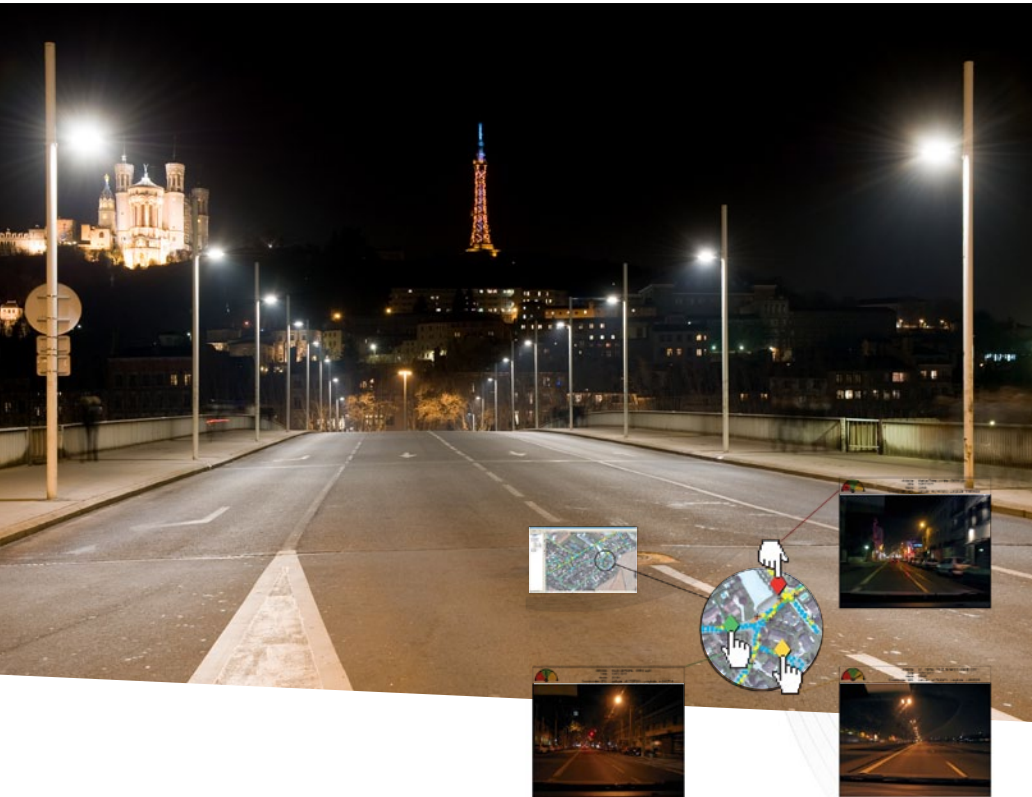
Budget

Project 1: € 60 000

Project 2: € 8 500

Maintenance and quality control

- Ensuring proper standards and maintenance of public lighting is one of the most important responsibilities of cities. By implementing projects with lighting design that prioritizes easy to maintain installations, as well as intelligent control systems, cities can effectively monitor their street lighting networks and ensure the quality of their lighting, as evidenced by the cities of Leipzig, Lyon and Birmingham.



New device to measure lighting levels in Lyon

The City of Lyon has developed a new measuring device in order to ensure compliance with the European standard EN 13201 which details lighting levels advised for each kind of road surface.

The municipality had launched a tender to design and develop an automatic measuring device to quantify and qualify street lighting levels. The winning proposal, made by Eclatec, conducts lighting measurements at 20 cm above the ground level using three load cells. The system, which is installed on a trailer, is also very precise due to the use of multiple geopositioning systems such as GPS, GLONASS and the soon to be launched Galileo.

"This will help us to ensure that the lighting at every point on the street meets the quality standards set by the EU," says Antoine Bouchet, Director of Public Lighting in Lyon. This technical solution has been operational since the end of 2011 and the first tests all over Lyon will start in 2012.

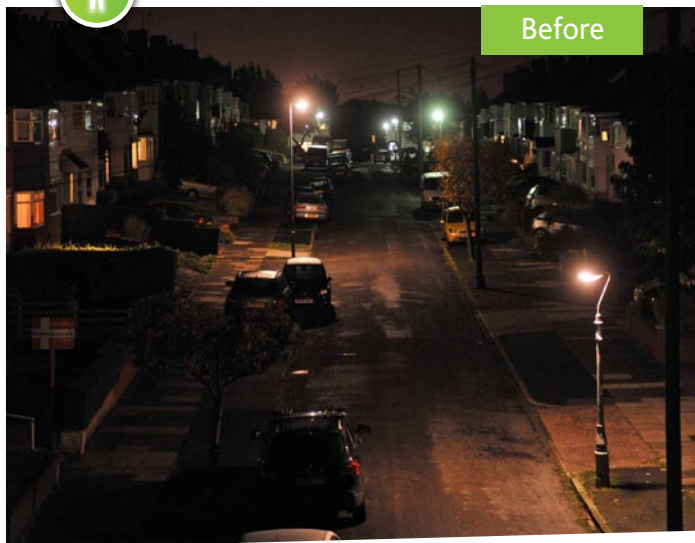


Centralized control for efficient lighting in Leipzig

In order to optimise its public lighting maintenance system, the City of Leipzig has put in place a highly automated control structure with a detailed and up-to-date system file on existing urban lighting. *"We set up this centralized system control file to manage and control the technical parameters of the public lighting system in a way that is easily comprehensible. The total operation status of the city lights can be displayed in almost real time in the office. It enables us to improve the lighting management. The whole lighting system can be controlled as needed for saving energy,"* explains Rainer Barth, Deputy Head of the Lighting Department in Leipzig.

Both the general street lighting and the special facade lighting can be monitored and influenced at any time through the eight signal channels available. Specific modes of operation are possible for special events, such as New Year's Eve or the Leipzig festival of lights (Leipzig Lichtfest). Peripheral districts without control channels are connected to the central control station via SMS. The system thus enables the lighting department to control almost all the light sources in the city, which means that lighting faults can be eliminated within 0.7 days on average. It is also able to apply different switching and dimming scenarios and make considerable savings in energy consumption.

Leipzig is continuously expanding and updating this system control file, and it will be possible to later have all system-relevant components available at the click of a mouse.



Before



After

Birmingham: implementing a lighting control and monitoring system

The City of Birmingham (UK), which is currently implementing a large scale LED street lighting system, one of the first of its kind, is also putting in place a public lighting control and monitoring scheme.

The monitoring system, which was demonstrated to PLUS lighting experts during Birmingham's "Deep Dive" site visit in November 2011, will provide dynamic control and management of the city lighting infrastructure.

In 2010, Birmingham signed a Private Finance Initiative (PFI) contract with public services provider, Amey, for the design, implementation, financing and operational maintenance of the street lighting across the city. This includes asset management with risk transfer to Amey and full responsibility for service delivery and management of the public lighting across the city. The contract, which lasts for 25 years and has a value of £2.7bn, is the biggest local government highways sector contract in the UK and has attracted over £686 million in grants from the Central Government.

The project will see the replacement of approximately 50% of Birmingham's 90 000 street lighting points by LEDs within the first 5 years, with the remainder of the lights being replaced and upgraded during the rest of the project period.

A lighting control and management system, which aims to connect every lighting point in the first 5 years of the project, will facilitate optimum management and maintenance of the street lighting network, with dynamic and flexible control of each individual lighting unit. As the light output

of individual lighting units can be infinitely modified, for example, by a single watt, rather than tens of watts, it will be possible to use the minimum possible energy while maintaining the necessary lighting standards. The city will also soon introduce dimming to vary light levels based on traffic flows and street activity levels.

This approach will promote reduced energy consumption and over-lighting, and ensure more efficient lighting systems that operate with reduced maintenance and greater performance quality and control. What's more, the new lighting solution is expected to cut carbon emissions associated with the city lighting by approximately 50%.

Birmingham is the first municipal authority to implement a control and monitoring system on this scale in conjunction with innovative LED lighting technology. "The long term contract (25 years) is the basis for Amey's evaluation and decision to invest on this scale, in order to save over the long term rather than reflecting simply for the short term," explains Barry Hale, Street Lighting Director at Amey.

The new lighting systems are receiving favourable responses and feedback from stakeholders and communities, and the quality of the LED lighting is a significant part of this positive response.

The new lighting solution is expected to cut carbon emissions by approximately 50%.

IDENTITY CHIP

Location: Birmingham U.K.

Population: 1 million

Stakeholders

Project director: Amey / Birmingham City Council

Lighting design: Amey (Ian Evans lead)

Manufacturers: Indal (WRTL) – LEDs
Telensa – Control and Monitoring System

Installation: Amey

Maintenance: Amey

Implementation

Project launch date: June 2010

Duration of the project: 25 years (initial 5 year mass lighting replacement programme)

Technical details

Luminaires: Indal (WRTL)

Lamps: Indal (WRTL) – Cree LED chips

Power (watts): variable LED configurations

Energy consumption: 62 500 MWhr (Year 1) to 31 250 (Year 25)

Estimated life expectancy: 25 to 30 years (LEDs) / Lighting units 50 years

Budget

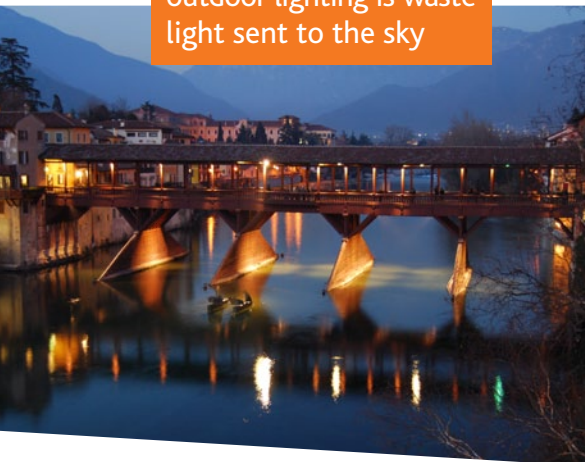
Running cost: Incorporated total budget

Maintenance cost: Incorporated total budget

Total cost: £2.7 billion (over 25 years)

Reducing light pollution

An estimated 30% of outdoor lighting is waste light sent to the sky



- Poor lighting design often leads to waste light emitted towards the sky instead of illuminating the areas to be lit. Excessive lighting can disturb natural flora and fauna, potentially damage human health, and prevent astronomical observations. With 90% of the EU population living under an artificial perennial moonlight and about 50% having lost vision of the Milky Way, many cities are taking action to reduce light pollution. Eindhoven, Bassano del Grappa and the partners of the European Life+ Life at Night project in Slovenia show the way...

Regione Veneto aims to reduce light pollution

Reducing light pollution is one of the primary objectives of the City of Bassano del Grappa, which lies in the Regione Veneto, the first Italian region to enforce a law against light pollution in 1997.

This regulation, which was recently updated in 2009, ensures that all new lighting installations must be authorized by city councils and provides for a mechanism to bring existing lighting installations up to the required standards. New lighting schemes must satisfy well defined technical rules (limited flow of light towards the sky, proper quantity of light to the ground in line with the minimum foreseen by the technical specifications, choice of energy efficient sources and devices, etc.).

The regulation also makes it obligatory for city councils to draft a lighting strategy for the realization of new lighting schemes as well as for the renovation of existing schemes.

"Raise awareness of the city councils and the population, train project managers, and plan and properly design all lighting installations," is what needs to be done to reduce light pollution, according to Dr. Laura Belleri and Dr. Adamo Bellini from the Regional Environmental Protection Agency of the Veneto Region (ARPAV).

In the meanwhile, Bassano del Grappa is busy working on drafting its Public Lighting Plan for the Containment of Light Pollution (PICIL) in accordance with this new regional legislation.



Through the use of facade-shaped shades, less than 5% of the light is emitted into the sky

Light pollution free luminaire for heritage sites in Slovenia

The Life+ Life at Night project is a European project that aims to find appropriate technical solutions for nature-friendly and energy efficient illumination of cultural heritage sites. The project, which runs from September 2010 to February 2014, is composed of six partners, all based in Slovenia.

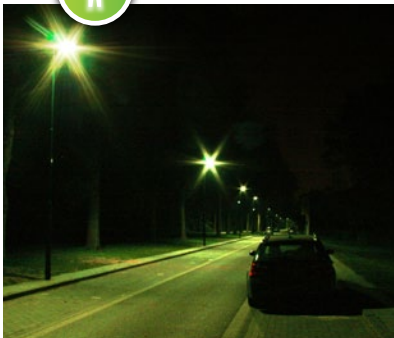
As more and more municipalities seek to enhance their architecture, the lighting of cultural heritage sites is also becoming an increasing problem, notably in the countryside where illuminated churches are one of the most important sources of light. *"This is the case for several small towns across the Slovenian countryside, where excessive lighting has endangered the habitats and natural cycles of various bats and moths,"* says Andrej Mohar, Project Coordinator and campaigner with Dark Sky Slovenia.

The main goal of Life+ Life at Night is to decrease, in the long term, the negative impact caused by illuminating churches in the countryside and thus improve

the conservation status and biological diversity of nocturnal animals such as bats and moths. *"With technical solutions, it is possible to achieve a very efficient reduction of light pollution. It is necessary to install lighting that will only illuminate areas where light is needed and only when it is needed,"* explains A. Mohar.

The project has thus developed a special luminaire for illuminating cultural heritage sites. Through the use of facade-shaped shades, less than 5% of the light is emitted past the facade into the sky. The luminaires also feature a special filter that does not permit blue light below 480nm to pass. Slovenian legislation prescribes that facade luminosity must be lower than 1 cd/m² with a facade luminosity of 0.2 cd/m² sufficient in the countryside.

The first preliminary results look promising so far - the new luminaire attracts nocturnal insects at least 10 times less as compared to existing technology!



IDENTITY CHIP

Location: Eindhoven (The Netherlands)
Population: 218 000

Stakeholders

Project director: City of Eindhoven

Lighting design: Mijnsen Dynamische Mobiliteit B.V.

Manufacturers: Innolumis Public Lighting B.V. (luminaires), Nedal Aluminium B.V. (poles), Maiken B.V. (controls)

Installation: Heijmans Technische Infra B.V.

Maintenance: Heijmans Technische Infra B.V.

Implementation

Project launch date: October 2010

Duration of the project: 6 weeks

Inauguration date: September 2011

Technical Details

Luminaires: Golden Green

Lamps: Lumis LED

Power (watts): 36 W

Energy consumption: variable (depending on detection)

Estimated life expectancy: 80 000 h

Budget

Total cost: € 67 500

Eindhoven: tackling light pollution with innovation

The City of Eindhoven (The Netherlands) has implemented an innovative new project to minimize light pollution and save energy using green LEDs on Velddoornweg, a rural road on the outskirts of the city. Arthur Noordhoek, Project Manager Lighting for the City of Eindhoven tells us more about this initiative...

What were the municipality's objectives in the project?

Velddoornweg is a road which runs through a rural area and which connects Eindhoven with the surrounding villages. This is an important cycling route through an area with lots of trees. Usually, if a key cycling route passes through a nature reserve, an assessment is made as to whether lighting which enhances safety for cyclists and which has a minimum harmful effect on the flora and fauna, can be installed. We were looking for lighting respecting the green structure, meaning as less light pollution as possible and as less inconvenience as possible for the animals.

What are the main lines of action?

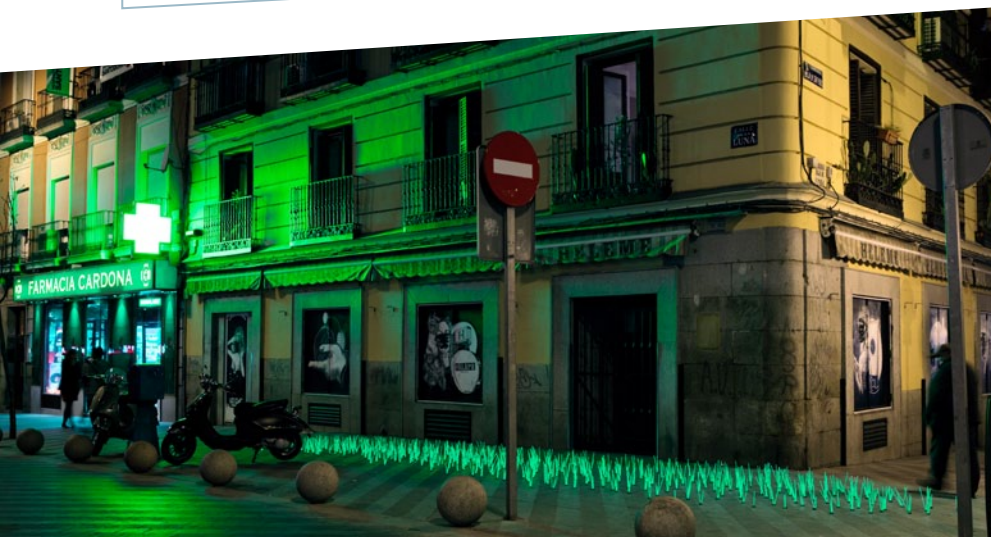
In search of a lighting solution that minimized energy consumption as well as light pollution and disturbance to the natural fauna, we decided to install dynamic green LED lighting. 38 luminaires along the 1 km long Velddoornweg road light up when necessary through a dynamic system. Doppler detectors are used to detect cyclists. The LEDs are equipped with a wireless radiofrequency system through which each LED can be controlled separately. The system was delivered in the beginning of September last year, and we are currently experimenting with the technique and the different levels of light intensity.

Why green LEDs?

We choose green lighting for Velddoornweg because, as proven by scientific research, at low light levels the human eye is more sensitive to light in the green part of the spectrum. Using this mesopic efficiency, less light can be used compared to normal light sources to get the same visibility. Additionally, when light is used for the detection of traffic, animals are more comfortable with the lower light level. This is a new innovation that we are experimenting with. Being a living lab, the City of Eindhoven chooses with emphasis not to implement fully developed products and offers companies and researchers the chance to test and refine their products and ideas.

What consequences has this project had?

The use of detectors in combination with green light results in a minimal disturbance of the ecological environment, while it also provides sufficient visibility for safe use by particularly slow traffic. The feedback from users has been generally positive although we have had some problems regarding vandalism and theft of detectors. An evaluation of the project is planned in the near future.

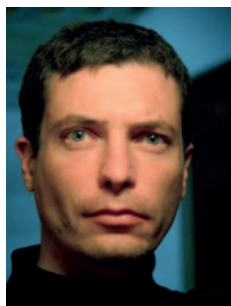


Mutant Weeds

In early 2012, Luzinterruptus, a group of anonymous light artists based in Spain created this lighting installation, entitled "Mutant Weeds" on the streets of Madrid to draw attention to the problem of light pollution from pharmacy signs in the city.

Equal and free access to urban lighting

- Public lighting is one of the basic needs for living in urban areas.
- By ensuring that lighting addresses the needs of all citizens, regardless of their social status and physical conditions, cities can create sustainable urban spaces. Implementing lighting strategies that not only take into account the requirements of marginalised groups, but which also extend across suburban areas rather than just the city centre are some ways to ensure this...



Understanding the needs of visually impaired persons at night

Cyril Chain, an international expert in light and lighting for the French Ministry of Sustainable Development, working at CERTU (a technical centre attached to this Ministry dealing with urban activity and development), recently organized and chaired the first international CIE symposium on elderly and visually impaired people regarding vision and lighting applications in South Africa. He tells us about a research project in Lyon he was involved in, that explored the needs of visually impaired persons at night, especially in relation to urban lighting and street furnishings.

Do you have any statistics on visually impaired people in France and in Europe?

The World Health Organization (Bangkok, 1992) has defined a visually impaired person as someone with a visual deficiency even after treatment, whose vision is inferior to 6/18. By this definition, 9 out of 1000 people are visually impaired in the industrialized countries, with 540 000 persons in France, out of which 68 % are over 65 years old. If we include a slightly broader definition that takes into account the degeneration of visual ability due to age, then this affects approximately 8 % of the population in industrialized countries, and over 4 million in France. This number will naturally increase with the aging of the population.

Could you please tell us about the study conducted in Lyon?

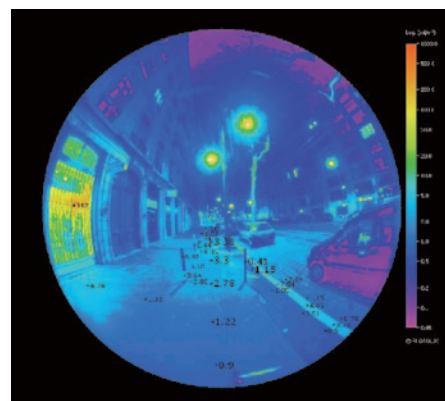
The study was conducted in collaboration with the City of Lyon, Ingélux, ENTPE, EDF, and the Comité Louis Braille. It took place on the streets of Lyon and included interviews with 73 people (including 62 visually impaired people and 11 people with normal eyesight) based on different scenarios and situations in the city at night-time. These included the exploration of the lighting installations, urban furnishings, road markings, street name panels, road surface photometry, and the quality of light sources.

What were some of your findings on the problems and needs of visually impaired people regarding lighting in the city?

We confirmed some initial ideas such as for example the fact that visually impaired persons have difficulty perceiving the separation between the sidewalk and the roadway. Another problem is the light coming from the ground or below eye level, which leads to glare for both the visually impaired as well as the people with normal

Cities should maintain a minimum lighting level and particular importance must be given to the uniformity of the lighting

eyesight. Finally, visually impaired people often have difficulties identifying bus shelters, detecting crosswalks even from 7.5 meters away, or reading street name signs. We also discovered that some initial notions appeared to be wrong. For example, glare from public lighting fixtures appears not to be a problem for visually impaired people since they tend to look down to the pavement to detect the obstacles, not towards the luminaires. The spectrum of the light sources is also not a major concern since the results were identical for visually impaired and well-seeing people except for fluorescent light sources which induce trouble for people with cataract.



What are some suggestions on how cities can take into account visually impaired peoples' needs regarding urban lighting?

Results show that cities should maintain a minimum lighting level. There should be enough light, otherwise visually impaired people don't feel secure and don't go out. Particular importance must also be given to the uniformity of the lighting of the pavement. Results dealing with sidewalk and roadway discrimination suggested that the use of different colours of light sources for the different spaces is not an effective solution since it doesn't increase local contrast. It was also found that luminous road markings (LED studs) are not very efficient because they are not detected very well. Moreover, it was observed that the luminous sources below eye level should not be directly visible to pedestrians. This has been observed for visually impaired people as well as for people with normal eyesight.



Ghent: integrated light planning going beyond the city centre

The City of Ghent (Belgium) is using lighting as an essential part of its policy to integrate peripheral areas of the city.

While its first lighting master plan aimed mainly at illuminating buildings, monuments and landmarks in the historical city centre, the City of Ghent is now also applying similar lighting strategies in its suburbs with its second lighting master plan.

Ghent aims to improve the quality of life in these areas by strengthening the spatial, functional and social fabric through lighting subprojects that are gradually being implemented in each of its 25 districts, often as part of a broader urban renewal project.

One such project, "Oxygen for the Brugse Poort district", addresses the areas of Brugse Poort, which has a lack of social cohesion, poor housing conditions, and inadequate use of public space; Green Valley Park, a densely populated district next to a six hectare municipal park; and the Red Strip, a road linking Green Valley Park (and the city centre) with the Bourgoyen nature reserve at the outskirts. *"The objective of the urban renewal and lighting plans for these areas was to revitalize them by reinforcing the functional, social and cultural mix of the area, strengthen their identities, and improve the nocturnal landscape as well as the quality of life of the inhabitants,"* explains Philip De Roo, Ghent Lighting Strategy Programme Manager.

With this in mind, various interventions have been implemented according to the guidelines of the Ghent Light Plan II such as:

- The Red Strip, the backbone that runs through the district connecting it to the city centre, is illuminated with warm white light;
- Residential streets are illuminated with projectors on the building facades, equipped with a flat glass to prevent glare and a 70 W or 100 W lamp (depending on the width of the street) that produces warm white light;
- The parks are illuminated indirectly, using a 70 W lamp on top of a pole reflecting its light on a white disk;
- The facades of the buildings around the newly created Pierkespark, the former school, the former headmaster's residence and the theatre, are lit in the same fashion as the historical city centre;
- The entrance of the former school, visible from the main residential street, is also illuminated with respect for its architecture.

The use of appropriate lighting is meant to add to the pride of the locals and bring about an overall sense of security and well-being. The project, which had strong inhabitant participation levels, has already boosted the neighbourhood through cultural and urban renewal and has improved the image of the district among the 24 other districts of Ghent.

IDENTITY CHIP

Location: Ghent (Belgium)

Population: 246 719

Stakeholders

Project director: City of Ghent

Lighting design: Grid operator Eandis (Ghent) and Atelier Roland Jéol (Lyon)

Installation: Eandis

Maintenance: Eandis

Manufacturers: Schröder, Meyer, BEGA

Implementation

Project launch date: June 2002

Inauguration date: 2011

Technical details

Luminaires: Neos2 Schröder (street lighting), BEGA (low and indirect park lighting), Meyer (architectural lighting)

Lamps: 10 x CPO 60 W, 2 x CDO-TT 70 W, 6 x CDM-T 70 W, 5 x CDMT 150 W, 92 x CDM-T 100 W

Power (watts): 11.71 kW

Energy consumption: 4 100 h / year 11.71 kW = 48 011 kWh/year

Estimated life expectancy: 12 000 h / lamp

Budget

Total cost: € 225 000

Running cost (in 2010): € 7819.35

Maintenance cost: estimated between 750 and € 1 000 / year

Public lighting for the informal areas of Iasi



In the last few years, the City of Iasi, has seen a decline in residential investments which normally provide infrastructural elements such as electricity, heating, water, sewage and of course public lighting. As a result, there has been an increase in informal residential areas that lack basic utilities such as street lighting.

The City of Iasi has thus made provisions for the extension of the public lighting network to these informal areas by including a supplementary circuit in the low voltage network. The lighting support consists of the installation of recycled luminaires with sodium lamps, their maintenance, and the payment of their energy cost. *"The design is minimal, the lighting requirements are not completely fulfilled, but light pollution is avoided due to cut-off luminaires, and electrical standards are strictly respected, not*

only for safety but also for energy measuring," explains Catalin-Daniel Galatanu, lighting expert for the City of Iasi and Professor at the Technical University of Iasi.

The lighting masts are labelled from the beginning and the database is extended with this new information. *"This operational approach gives the possibility to extend the public lighting even if the city budget doesn't have the money for this. Of course, for the future some improvements are expected. The most important is that the Municipality covers the energy cost and also the maintenance,"* he adds. These measures have included new residential areas in the city and have created the possibility for the provision of other public utilities (water, sewage, natural gas).

Creating a safe and comfortable environment

- Ever since the very first street lamps, lighting has aimed to make cities safer and more secure to live in. Today, it still plays a vital role in creating an urban environment that is not only comfortable, but also pleasant and inviting. Better lighting can also significantly improve the quality of life in cities by providing opportunities for leisure at night time or by creating welcoming areas within the city...



Special lighting for safe pedestrian crossings in Tallinn

The City of Tallinn (Estonia) has been devoting much attention to illuminating unregulated crossings with better lighting to ensure pedestrian safety, and currently has 286 pedestrian crossings equipped with customized luminaires.

The city, which has been testing a new generation of 70 W LED luminaires seeking a solution that not only adequately illuminates pedestrians but also reduces energy consumption, has reached some positive conclusions. "It was all the more pleasing to discover that the results of the LED switchover are indeed both visually and technically approximately the same as

those demonstrated by new 150 W metal halogen lamps or their outdated 250 W counterparts. The substantial differences in the power ratings and the luminous fluxes are explainable by the more precise light distribution and the considerably better light output ratio of LED luminaires," explains Tarmo Sulg, Deputy Head of the Tallinn Municipal Engineering Services Department.

Boosted by this new lighting solution, the City of Tallinn plans to continue researching potential applications coupled with motion sensors.

New lighting for Nice's Promenade des Anglais

Métropole Nice Côte d'Azur (France) will soon be implementing a project renovating the lighting of its celebrated walkway, the Promenade des Anglais. The Promenade, a 7km long paved walkway along the Mediterranean Sea, is popular (with tourists and locals alike) as a meeting place, cycling/running route, and central axis of commercial activity.

The city has planned a renewal of the lighting of this area with the aim of reducing light pollution and increasing energy efficiency. "We wanted to ensure that this essential area of Nice, which is an important part of the daily activities of many inhabitants, will remain a welcoming and secure place. We also wanted to maintain its original character" says Jean-Michel Piecuck,



Manager of Public Lighting in Nice. The city will thus be retaining the iconic spherical lamps that line the promenade and form Nice's waterfront "pearl necklace".

The project will reduce energy consumption by over 50%, totalizing 1.2 million Kwh

A call for tenders will enable the replacement of damaged columns and lamps, and improve the electrical network with the installation of new equipment and class II electrical cabinets.

The project will reduce energy consumption by over 50%, totalizing 1.2 million Kwh. An efficient replacement of the materials will contribute to reducing luminous flux from the ground to the sky.



Sofia: reviving the city with innovations in public parks

The Municipality of Sofia (Bulgaria), which is exploring energy efficient lighting solutions that also enhance its night-time ambiance, has launched a series of innovative pilot projects to develop its public lighting system. The city, which offers its citizens night skiing, night ice-skating and night bicycling opportunities, is focused on enabling inhabitants to enjoy more outdoor activities at night. Lyubomir Hristov, Deputy Mayor of Sofia tells us more about one project in particular...

What is the context of the project?

Besides our commitment to meet the European Union's objective of reducing CO₂ emissions by 20 %, another principal objective of our public lighting strategy is to create a safe and comfortable environment for the people of the city. We illuminate our parks and provide lighting for recreational sports areas at night in order to provide our citizens with a secure and pleasant environment for their activities after dark. One example combining these two objectives is Park Studentski (Students' Park) situated near two of the biggest universities of Sofia - the Technical University and the University of Forestry. This area, a students' dormitory complex, is an important academic centre and a busy residential district.

What are the concrete actions of the project?

The Municipality of Sofia has replaced the old mercury vapour lamps along the park pathways with panels combining LED luminaires and photovoltaic cells. These luminaires run solely on solar power and are not even connected to the electricity network. They have been specially designed for the city by professors and

students from the Technical University of Sofia, and manufactured and installed by specialists from the private company Denima 2001.

What impact has this initiative had so far?

The new lighting system is of course more energy efficient. But more importantly, the project has also contributed to the urban regeneration of the area. Before, the park was poorly lit as many of the old luminaires were broken and needed to be replaced. It was perceived as uncomfortable and unsafe at night. Now the park is an attractive area not only for students, but also for mothers with children, pet owners, retired people and everyone looking for a pleasant place to rest during the day and also after dark. It has brought together the university, the residential areas and the citizens. It has also led to further development of the park – the Municipality of Sofia recently inaugurated the largest skateboarding site in the Balkans here, and its numerous ramps and equipments are lit after dark as well. We have also succeeded in introducing this innovative lighting system in other parts of the city.



IDENTITY CHIP

Location: Sofia (Bulgaria)

Population: 1 300 000

Stakeholders

Contracting authority: Municipality of Sofia

Manufacturer: Denima 2001

Lighting design: Technical University, Sofia

Installation: Denima 2001

Maintenance: "Ulichno osvetlenie" JSC

Technical details

Number of luminaires: 80

Lamps: LED lamps

Power (watts): between 50 and 115 W

Energy consumption: 25 lumen / Watts

Budget

Total cost: € 10 000

Implementation

Project launch date: September 2010

Duration of the project: 8 months

Inauguration date: April 2011

Building the urban and cultural identities of cities



Patras: special lighting for the iconic Rion-Antirion bridge

The Rion-Antirion bridge, crossing the Gulf of Corinth near Patras (Greece), is the world's longest multi-span cable-stayed bridge, and an iconic landmark for the Patras region.

Designed by architect Berdj Mikaelian and implemented by Vinci, the 2 252 m bridge which is considered a feat of engineering, was the highlight of the site visits during the PLUS Deep Dive in Patras. The objective was to light the bridge to create a landmark that could be seen from afar, aiming to highlight the structure rather than bathe it in light. *"The concept underlying the architectural lighting of the bridge is that of a thin golden thread woven through four large*

blue-tinted needles. We aimed to create a layering of shadows, relief and textures," explains Roger Narboni, Lighting Designer from the agency Concepto which was awarded the contract to light the bridge.

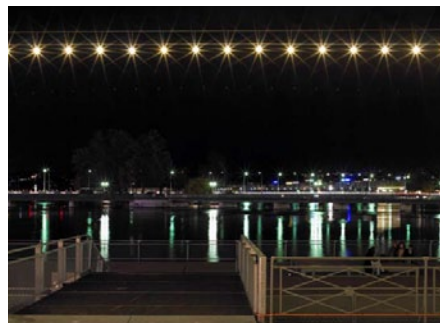
Creating a landmark to be seen from afar

The lighting scheme for the bridge, which was particularly challenging to illuminate as it required a lighting solution that could also withstand winds of over 200 km/h and strong seismic activity, is the past winner of the IALD award of merit in the category of monumental structures and public spaces.

Customized LED lamps for Lake Geneva's Fairy Lights

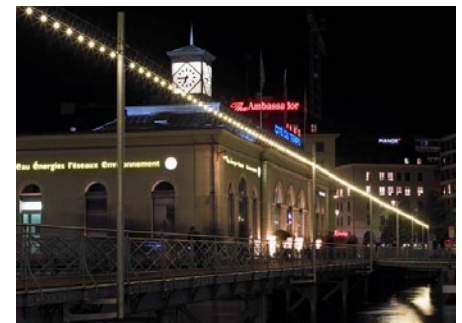
The City of Geneva (Switzerland) was awarded the Watt d'Or 2012 by the Swiss Federal Office of Energy (SFOE) earlier this year for its innovative work developing new LED lamps for the Fairy Lights, the decorative light garland encircling the Lake Geneva.

The Fairy Lights around Geneva Harbour have been a special night-time feature of the city for over a hundred years, but this attraction was facing the threat of extinction as a result of the ban on



conventional light bulbs which enters into effect in autumn 2012. In view of this, the authorities of the City of Geneva developed a new type of LED lamp with the lighting properties of a conventional bulb. By replacing 4200 incandescent light bulbs with these customized LED lamps, the city has managed to retain the characteristic look and effect of the Fairy Lights while significantly reducing energy consumption.

"Our objective was to increase the energy-efficiency of our public lighting system. But



the LED lamps on the market at the time couldn't provide the warm glow of the old incandescent Fairy Lights. This is why we initiated the development of such a solution ourselves," explains Olivier Candolfi, Public Lighting Engineer for the City of Geneva.

The project, part of Geneva's lighting plan which has the motto "Better light for less consumption," also won the Auroralia Award 2010 for this innovative process launched by the city.



Burgos: setting the stage for its famous cathedral

The City of Burgos (Spain) has a rich historical heritage with three UNESCO Heritage monuments, including the Burgos Cathedral, which was declared a World Heritage Site in 1984. The city, which is also on the Santiago de Compostela pilgrimage route, aims to use lighting to highlight its architecture as part of its city marketing strategy.

In line with its policy to enhance its architectural heritage with light, the Burgos City Council has initiated a renovation of the lighting of the areas around the Cathedral, as well as the cathedral itself, a project that visiting PLUS lighting experts got the opportunity to see first-hand during the PLUS Deep Dive in Burgos.

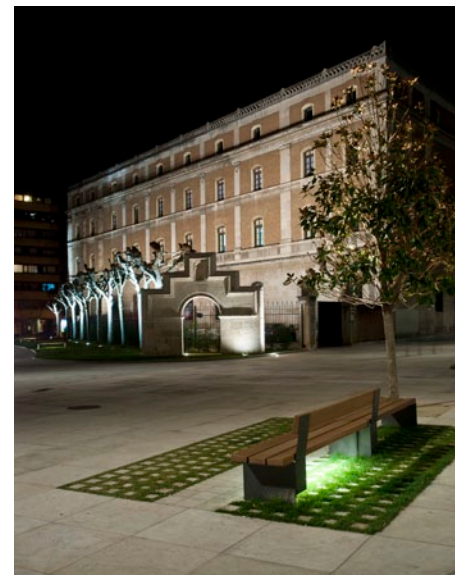
The first phase of this light plan, which dealt with the new lighting scheme for the surrounding streets and buildings, was developed in parallel with the rest of the urban design initiative, seeking integration and complementarity between both. The lighting plan, implemented by Architectural Lighting Solutions, has used light as a tool to achieve urban rehabilitation and to draw out the character of the city's central square. The objective is to generate a welcoming meeting space for inhabitants and visitors as well as to create the framework for the forthcoming illumination of the Cathedral, which constitutes the second phase of the project at present under development. Light is used as a means to express the architectural wealth of the area, its different functions and distinctive features. *"The purpose of the lighting plan has been to make that space more welcoming, as if it were a large lounge. The streets, like corridors, lead pedestrians towards that lounge in which the walls are decorated with pictures that are illuminated and the floor is adorned with objects and lights, focusing attention on the main element, which is the Cathedral,"* explains Lighting Designer, Anton Amann.

In line with this, the old cast iron street lights have been removed and lighting with a new design has been chosen to create a new luminous environment in the area. In addition, the urban furniture, such as benches, stairs, and restaurant terraces have been lit up and considered as integral details of the entire structure.

The purpose of the lighting of the Cathedral complex and surrounding areas is to create a unitary image in such a way as to set

the frame for and intensify the value of the exceptional Gothic architecture of the building, which dominates the city skyline.

As explains A. Amann, *"We have at one hierarchical level the vertical facades that encircle the space; a second hierarchical level is defined by light carpeting the floor and the pedestrian lighting; a third hierarchical level*



of key elements (the urban furniture); and we have the Cathedral itself at the fourth and final hierarchical level, that stands illuminated in centre stage, claiming the importance that it deserves."

The first phase of this lighting project, which was completed in late 2011, has also resulted in some energy savings, with total operational costs being lower than the costs before the intervention. The use of modern lighting technologies has ensured the sustainable illumination of the cathedral, even 365 days a year. In addition, the renovation of public lighting, which has transformed the area, represents a turning point for commerce, hotels and tourism activities in the zone.

IDENTITY CHIP

Location City: Burgos (Spain)

Population: 179 251

Implementation

Project launch date: 15 September 2010

Duration of the project: 6 months

Inauguration date: July 2011

Stakeholders

Project director: Luis María Arce Lastra, Juan Freyre de Andrade Calonge, Anton Amann

Lighting design: Proyecto de Iluminación: ALS Architectural Lighting Solutions

Manufacturers: Phillips (among others)

Installation: Construcciones Ortega, SA - Montajes Eléctricos Castellanos, SA

Maintenance: URBALUX (External Subcontracting Urban Lighting Maintenance)

Technical details

Luminaires/Lamps: various LED and metal halide

Full technical details in the PLUS showcase at www.luciassociation.org/plus

Power (watts): 26 859 W (overall power)

Supporting an environmentally friendly mobility

- Cities are constantly evolving, and have new imperatives of sustainability that demand alternative modes of transport.
- Lighting, which already plays an essential role in ensuring safety for automobiles and pedestrians, can also be a means of promoting green mobility with innovative lighting systems that properly illuminate bicycle lanes, public transport and pedestrian routes. The cities of Bassano del Grappa, Dresden, and Leipzig are all involved in such projects linking lighting and sustainable transport...



First LED-lit bridge for cyclists in Dresden

The new Molen Bridge in Dresden is the first route exclusively for cyclists that connects the city centre to the peripheral Ubigau district.

The 80 m long and 3 m wide structure crossing the river has been lit by Straßen und Tiefbauamt, Dresden's municipal engineering department, using LEDs encapsulated in a transparent plastic housing that fits directly into the underside of the handrail. During the day, the fixtures' presence goes virtually undetected, but beginning in the twilight hours, the

luminaires produce an unbroken ribbon of light, uniformly illuminating the way. Thanks to the fixtures' carefully planned positioning, glare is at an absolute minimum for pedestrians, cyclists and boats on the river.

The LED handrail fixtures are installed on just one side of the bridge, minimizing light pollution, and enabling it to blend harmoniously into its surroundings. The new lighting is even insect-friendly thanks to the UV-free light produced by the LEDs!

Bassano del Grappa: an integrated approach to mobility and light planning

The City of Bassano del Grappa, which adopted a Sustainable Mobility Plan on the 13th of March 2012, will be planning a lighting scheme to complement its mobility planning and promote sustainable forms of transport.



Bassano del Grappa's Sustainable Mobility Plan aims to reduce the use of cars and provides incentives for alternative modes of transport by improving the situation for cyclists, pedestrians, and users of public transport. In order to ensure the optimum use of the new transport solutions proposed, the city lighting plan, which is currently under elaboration, will be closely linked with this Sustainable Mobility Plan.

Lighting for bicycle lanes, pedestrian areas, environmental islands (the city centre, study centre, areas with major traffic problems) and for the management of parking and urban public transport (i.e. bus stops) will be coordinated with the sustainable mobility analysis to ensure in-depth analysis and well-tailored technical solutions adapted to each zone.

Thus, the selection of the type, quantity and timing of illumination for these transport channels and the resulting

technical choices to be made will go hand in hand with that of the mobility plan. The main priority of the lighting, from a technical point of view, will be to address safety parameters, identify lighting conflict areas, and to reduce energy consumption levels and operating times

Lighting for bicycle lanes, pedestrian areas and public transport will be coordinated with the sustainable mobility analysis

based on the rhythms of the city. The levels of illumination will be consistent with the classifications of roads, according to criteria related to traffic safety, pedestrian and vehicular traffic density, and presence of commercial or green areas, already defined in the

mobility plan. The Sustainable Mobility Plan also includes BICIPLAN on the realization of the cycle lanes and their correct illumination.

The city is also considering the establishment of limited traffic areas in different zones, such as the old town. The proposal of such a limited traffic area in the old town is linked to the elaboration of a specific lighting analysis (included in Bassano's lighting plan) based on the historical, architectural and aesthetic aspects of the area. The lighting plan for this soon to be pedestrian zone, takes into account the requirements of everyone involved – from the residents who request limited traffic, pedestrianization and lighting for security; the retailers, who require a place to unload goods (with appropriate lighting) and easy access by trucks; and cyclists, who require well illuminated bicycle paths and bicycle parking areas.

Combining smart mobility and lighting in Leipzig



The City of Leipzig, which has the second-largest tram network in Germany, has developed an attractive, economical, yet flexible, technically efficient and safe pole system that can be combined with its urban lighting and traffic lighting installations.

The redesign of the streets and the development of the light-rail system (tram) in the historical and touristic areas in Leipzig, has led to the development of a novel type of pole that combines the requirements of contact wire, street lighting and traffic signal installations. The numerous rods, switches and balance weights that are required for these different installations have all been placed inside the pole, leaving only clear filigree structures

visible. "Very specific requirements of each function regarding distance, height, electrical isolation and safety had to be observed as well as the maximum integration of technical facilities and structures such as weights and switches. Therefore we developed a pole family preferably made of steel to give a respectful and high-toned design," explains Heike Besier, Deputy Leader Section Public Space Design at Leipzig.

A joint initiative undertaken by the Urban Planning Office, Civil Engineering Office and Leipziger Verkehrsbetriebe in conjunction with the offices tagebau architekten und designer and stadt+verkehr, the project has also won the Renault Traffic Design Award.

Strengthening local economic development

- By its ability to enhance and improve the image of a city and its districts, well designed lighting can constitute an attraction for residents and tourists, as well as for commercial and economic activity. Light festivals are such a means of strengthening local economic development, as evidenced in numerous cities across Europe and the world. But other permanent lighting projects can also significantly promote local commercial and economic development...



Light festivals' capacity to draw visitors to the city appears as their strongest and most visible impact

Light festivals: evaluating their economic and cultural benefits

How and where can cities find concrete evidence to demonstrate the positive impacts of light festivals? A LUCI report on the "Economic and Cultural Benefits of Light Festivals", has, through contacts with 26 cities hosting over 30 light events and case studies of 10 lighting festivals from around the world, concluded that while evaluation methods vary from place to place, light festivals do indeed have an overall positive effect on host cities.

Their capacity to draw visitors to the city appears as their strongest and most visible impact. The festival host cities studied in the report, for example, have an average ratio of 3.4 visitors to every city resident. The Chartres en Lumières festival draws 24 visitors to any one resident and the Lyon Light Festival has a similarly high ratio at 8.6 visitors to every resident. And with increased visitors, comes increased spending. In Glasgow, for example, the

daily expenditure per overnight visitor for the Glasgow Radiance Festival of Light was calculated at an average of €97.

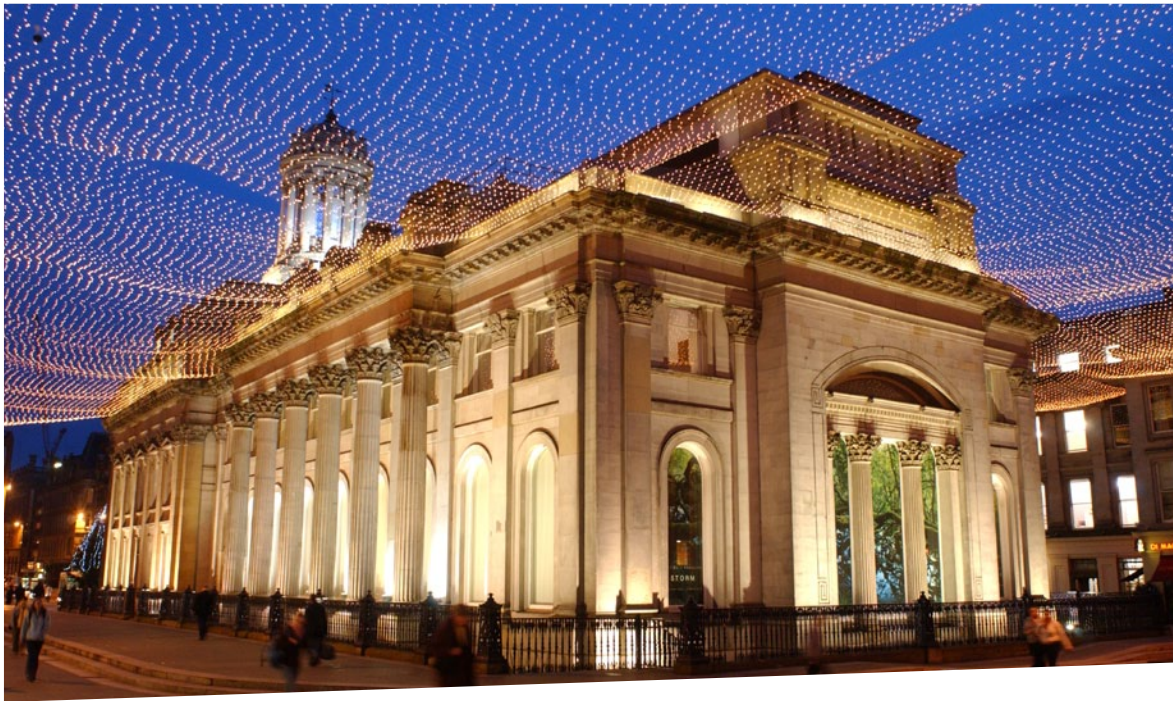
The socio-economic impact in terms of media coverage and image making can also be significant - in Osaka, the advertising value of media coverage as a result of the Hikari Renaissance festival was estimated at €2000000. The reputation of the city also reaps the benefits – a visitor survey led by the City of Glasgow in 2005 and 2007 showed that for approximately 95 % of respondents, the Radiance festival had a positive impact on the image of the city.

Moreover, light festivals play a major social role, in the sense that not only do they bring the inhabitants of the city together in shared activity and pride, on a more practical level, they are often sources of employment: in Medellin, the Christmas lighting festival creates jobs for hundreds of

people every year as part of the preparation activities for the event. In Eindhoven, a significant number of volunteers take part in the running of Lichtjesroute, a light event organised mainly by volunteers. The GLOW festival, also hosted by Eindhoven, similarly involves local volunteers and residents to support the event organisers.

Of course, gathering such qualitative and quantitative evidence that can demonstrate a festival's impacts is a complex exercise, and the report, drafted by the British consultancy firm, Cambridge Policy Consultants for the LUCI Culture Commission, highlights innovative evaluation methods and good practices.

More information on the report can be found on the LUCI website:
www.luciassociation.org



Glasgow's Ceiling of Light boosts the shopping ambience in the city

Commissioned by the Glasgow City Council, the Ceiling of Light project in the Royal Exchange Square and surrounds has had a positive impact on the ambience in the city centre of Glasgow (U.K.).

The installation of a "ceiling" of white pea lights above the pedestrian areas from October to March to create a "celestial sky" effect has enhanced the night-time environment during the dark winter months. The Ceiling of Light contributes to Glasgow's unique shopping experience during these months and helps

differentiate it from competitor cities and shopping districts. *"It creates a welcoming environment, and has possibly also led to a reduction in the amount of anti-social behaviour,"* adds Simon Smith, Lighting Strategy Coordinator at the Glasgow City Council.

The lighting installation, set up as part of the city's winter lighting scheme, has been implemented within the wider framework of Glasgow's Lighting Strategy, which aims to use light to reinforce the city's cultural and economic regeneration.

Gothenburg Christmas City: an economic success

Gothenburg Christmas City (Julstaden), a free open event celebrating the Christmas period, takes place in most of central Gothenburg (Sweden) from mid-November to 1st January. The event, which first began in 2004, has a total budget of €1 300 000 and creates a special atmosphere in the city centre with new Christmas lights and light shows. During the festival period, the city receives an average of 896 000 visitors - a visitor/population ratio of 1.75 visitors to 1 resident.

In order to assess some of the economic impacts of the festival, a total of 779 face to face interviews were conducted during a five day period in the city centre. 25%

of survey respondents stated that the main reason for their visit was Julstaden. 36% of visitors were from outside of Gothenburg. For 32% this was their first visit to Gothenburg in that year. 71% of respondents had also visited Julstaden the previous year.

The evaluation found that on average people were staying 1.78 nights and during their stay spent €116 on average. Based on these figures, the total indirect economic impact has been calculated at €185 000 000. Considering that for 25% of the visitors the main reason for a visit was Julstaden, the study evaluates the direct economic impact of the festival at around €46 250 000.

Although it is difficult to entirely isolate the festival from the wider Christmas context and the city's other concurrent events, it is



clear that it results in a significant positive economic impact on the city with an impressive cost/expenditure (income) ratio of 35.58!

Integrating external stakeholders

- By involving all stakeholders such as manufacturers, researchers, shopkeepers and citizens in their light planning, cities can ensure balanced and sustainable growth with a lighting strategy that is integrated into the overall urban development policy. The cities of Nice and Tallinn have put in place innovative partnerships with various stakeholders, but the question of how and when to involve the citizens themselves, remains a question to be answered...



New lighting technologies: public experimentation and public participation

Cities are constantly improving their urban lighting and testing new technologies. But how can the citizens be involved in this process? In her PhD project, Nona Schulte-Römer from the Social Science Research Centre Berlin (WZB) is studying LED test sites to understand the contribution of local actors to technological innovation. She tells us a bit more on public experimentation and the integration of public opinion...

Why are urban LED test sites important?

Urban test sites, such as, for example, the introduction of a small number of LED luminaires in a limited area or street, provide gateways through which the new technology enters the world. Their purpose is not to measure the technical performance of LED products - for this we have laboratories - but to show if the new technology, the built environment and the people who use it match.

How are citizens involved in this?

The ways in which public authorities involve the public in lighting decisions vary. One way, of course, is to ask citizens to co-finance new infrastructures. In that case you can be sure to get their feedback, although not always in favour of the best solution. Another option is to engage people in institutionalised political forms of public participation. Yet, without having compared lighting to other areas, it seems to me that involving people in qualitative questions is a particularly complicated task.

What are the difficulties?

First, there is a communication problem between experts and the people on the street. A layperson's statement "too bright" might hint at high light levels, at glare or a change to a white light colour. Then, people experience light differently depending on their individual physiological disposition, their cultural background and also depending on what they know about

light. This makes it even more difficult to form a coherent cross section of opinions.

Last but not least, you might ask a passenger if s/he feels safe at night and enjoys a place. Yet, what does that tell you about the quality of public lighting? The way streets or squares are lit only contributes to our feeling of safety or an attractive inner city atmosphere but crime rates or the density of restaurants matter too. Researchers therefore take advantage

People experience light differently depending on their individual physiological disposition and their cultural background

of changes in lighting as they occur when LED luminaires are installed in urban test sites. As everything but the light remains the same the impact of a new technology can be singled out more systematically.

Could you tell us more about your observations regarding citizens' roles in the cases you have studied?

There is an inherent paradox in public lighting: the better the installations, the less they disturb, annoy or hinder people in their daily routines. The more unobtrusive the new technology, the better. Thus, the higher the quality of public lighting, the less visible is the work and technology

behind it. LED tests in public are usually perceived as successful if there are no negative responses.

Then why is public participation in new urban lighting installations still important?

The question is: should they be involved. Public lighting is a very complex task, namely the art of balancing visual comfort, traffic safety or the creation of urban atmospheres at the lowest possible energy consumption and cost. It is not the citizens' job to keep all this in mind.

But, there is a very good reason for involving those who will be concerned by the new light beyond financial issues. Best solutions are rarely obvious or undisputable. In Berlin, a citizens' initiative is currently trying to prevent the refurbishment of the historic gas lighting. They reject the key argument of energy and cost savings and claim that the world's largest open air gas light museum presents a cultural heritage that is worth being protected. From an administrative point of view, their position appears unacceptable. But discussions are difficult due to a great asymmetry in technical expertise and lack of shared experience. Figures and charts say little about particular urban atmosphere or the quality of gas light. I wonder if joint site visits and public tests could ease the conflict.

Tallinn: bringing stakeholders together to test LEDs

For the past year, the City of Tallinn has been implementing a LED test street project to help develop a common understanding on this new lighting technology's potentials and limitations amongst engineers, designers and municipalities.

Develop a common understanding on LED technology's potentials and limitations

"We wanted to give LED manufacturers a chance to show their lamps in the city streets and to prove their suitability – on a technical and economic level," explains Tarmo Sulg, Deputy Head of the Tallinn Municipal Engineering Services Department. The city has thus installed 42 LED street lights and 2



luminaires with induction lamps on the test street with the help of 24 manufacturers. It has also installed 17 LED park lights and 6 induction lamps in a park. The University of Tallinn is a key partner in the project, and is in charge of running the test street, recording measurements such as the energy consumption, power factor, THD (total harmonic distortion) and luminance between luminaires, and analysing the results.

The project, besides bringing together the city's key lighting stakeholders, has already led to some interesting first conclusions on LEDs. "We found that the cold light of most of the LED outdoor luminaires is good as regards to luminous efficacy and mesopic vision but that this solution is not appropriate for each

site. In our opinion, today LED lamps can be used for lighting parks and walkways but it is too early to change HPN lamps in streets to LED lamps," says T. Sulg. The City of Tallinn concluded the test street project in April with a stakeholder's discussion and came to the conclusion that LED lamps are in rapid development and that the technology has a lot of risks and threats which have to be eliminated before switchover. The city plans to compose detailed technical procurement and warranty rules in cooperation with the University of Technology, also one of the priorities of the European Commission, and will soon initiate a city lighting plan to determine suitable colour temperatures and LED design principles.

Showcase

Métropole Nice Côte d'Azur: experimenting on new technologies with partners

IDENTITY CHIP

Location: Métropole
Nice Côte d'Azur (France)
Population: 550 000
(350 000 within the City of Nice)

Implementation

Project launch date: May 2012
Inauguration date: May 2012

Technical Details

Luminaires: 2 LEP
Power (watts):
273 W per luminous point using LEP
Energy consumption: saving of 50 % (Factor 2)
Estimated life expectancy: 12 years

Budget

Running cost and Total cost:
special partnership with the product manufacturers

The Metropole of Nice Côte d'Azur (NCA), which considers it a priority in its public lighting strategy to develop new technologies, has a "technology watch" concept that aims to create a common framework gathering the many innovative tests taking place on the territory.

One of these tests, a pilot project using Light Emitting Plasma (LEP), has been in process this May to test the reliability and efficiency of this new technology. "NCA is more than confident that we will be able to achieve the 20-20-20 objectives for public lighting. However, the Kyoto protocol goal, which requires a reduction of energy consumption by a factor 4 before 2050, can only be achieved if supported by the implementation of efficient new technologies," says Jean-Charles Maleysson, Project Manager in Nice.

The NCA will thus be testing LEP in relation to LED technology by implementing both of them in the same street. Two luminous points of each technology will be tested.

The metropole has been monitoring LEP since its implementation and will obtain a first feedback in the near future. "LEP technology has promising economical assets since it allows us to set up one column every 50 metres instead of every 25 metres. This suggests savings not only in terms of investment but also in terms of maintenance costs," explains J.C. Maleysson.

This pilot project is being implemented within the framework of a special agreement between the Metropole of Nice Côte d'Azur and the product manufacturers, reflecting the NCA's desire to integrate stakeholders in its strategy whilst fostering new technologies.

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