



The Royal Danish Academy of Fine Arts,  
Schools of Architecture, Design and Conservation

KADK  
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## På tværs af Københavns gadebelysning 2014 / Into a Mapping of Copenhagen Street Lighting 2014

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# På tværs af Københavns gadebelysning 2014

# Into a Mapping of Copenhagen Street Lighting 2014

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# Indhold

- 6 Forord
- 8 Introduktion
- 10 Mapping som forskningsmetode
- 13 Mapping af Københavns gadebelysning 2014
  - Kortet
  - Ruterne på tværs
  - Data
- 29 På tværs af Københavns gadebelysning 2014 – cykelruten
- 173 Sammenfatning: At begribe gadebelysningens poesi
- 177 Essay: Tanker om den københavnske belysningskultur med LED
- 185 Referencer

# Contents

- 6 Preface
- 8 Introduction
- 10 Mapping as a Research Method
- 13 Mapping Copenhagen Street Lighting 2014
  - The Mapping of the Map
  - Into the Mapping
  - Data
- 29 Into a Mapping of Copenhagen Street Lighting 2014 - Cyclist Route
- 173 Summary: Grasping the Poetry of Street Lighting
- 177 Essay: Thoughts on Copenhagen's Lighting Culture with LEDs
- 185 References

# Forord

Denne bog er en af fire bøger udgivet i forbindelse med forskningsprojektet LEDlys; Interdisciplinær LED lysforskning. Forskningsprojektet har været et treårigt samarbejde mellem Det Kongelige Danske Kunstakademis skoler for Arkitektur, Design og Konservering, og IT-Universitetet i København.

Med LED-lyskilden (Light Emitting Diode) er der introduceret afgørende nye betingelser for belysningsområdet. Hvor lyskilder tidligere var konstante størrelser med fast definerede lysfarver og lysintensiteter, lancerer LED teknologien helt nye potentialer, hvor det er muligt at operere med komplekse forandringer af farvekvaliteter og lysintensiteter. LED er konvertibel til digitale styringssystemer, hvilket betyder, at en betydelig del af designudviklingen i fremtiden vil foregå som software-design, og at kunstlyset fremover vil være potentielt dynamisk, intelligent og adaptivt. På grund af LEDens meget lille størrelse er der mange muligheder for integrering af lyskilder i materialer, bygningstrukturer og byrum. Alle disse forhold har stor indflydelse på udformningen af fremtidens design, arkitektur og IT infrastruktur. Der er derfor et udstrakt behov for nyudvikling af begrebslige defineringer, udvikling af planlægnings-strategier, og der er i høj grad brug for en udforskning og identificering af nye æstetiske og kvalitative parametre i relation til LED. Projektet inddrager disse komplekse sammenhænge ud fra en særlig fokus på perceptuelle oplevelsesparametre som organiserende designprincip.

Forskningsprojektet er opdelt i følgende tre skala områder:

Mikro skala, – hvor LEDen er forstået og undersøgt som del af et pixel system. Projektet udforsker hvilke kvaliteter LEDen potentielt tilfører belysningsapplikationer i arkitektonisk kontekst. Publikationen *Pixel Eksperimenter*, beskriver udførte eksperimenter og hvordan erfaringer fra disse test-opstillinger danner mulige strategier for design af belysningsapplikationer med LED.

# Preface

This book is one of four books that is published in connection with the research project entitled LED Lighting; Interdisciplinary LED Lighting Research. The research project has been a three-year collaboration between The Royal Danish Academy of Fine Arts Schools of Architecture, Design and Conservation (KADK) and The IT University of Copenhagen.

The LED (Light Emitting Diode) light source has introduced new, crucial conditions to the field of lighting design. Where light sources have previously been of uniform sizes with predefined colour temperatures and luminous intensities, LED technology brings forth totally new potentials, where it is possible to operate with complex changes in colourations and luminous intensities. LEDs are moreover convertible to digital control systems, which mean that a significant part of design developments in the future will occur in the form of software design, and that artificial lighting will continue to be potentially dynamic, intelligent, and adaptive. Because LEDs have a very small size, there are many opportunities for their integration into materials, building structures, as well as urban spaces. All these factors exert major influences on the shaping of future design, architecture, and IT infrastructure. Therefore, there exists an extensive need for new developments in conceptual delineations, the development of planning strategies, and – to an especially high degree – an exploration and identification of new aesthetic and qualitative parameters related to LEDs. This project engages these complex contexts and concerns via a specific focus on perceptual experiential parameters as an organising design principle.

The research project is divided into the following three areas of scale:

Micro scale, wherein LEDs are understood and studied as part of a pixel system. This project explores the qualities that LEDs can potentially add to lighting applications in architectural contexts. This publication, *Pixel Experiments*, describes executed experiments and how the lessons learned from these test setups form possible strategies for the design of lighting applications using LED.

Medium skala, – med en fokus på det arkitektoniske rum som lysarmatur. Disse praksis-baserede undersøgelser er opdelt i to foki. Den ene handler om integrering af dagslys og dynamisk kunstlys, som udfoldes i bogen *Integration af dagslys og dynamisk kunstlys undersøgt gennem et iagttagelsesinstrument*. Den anden – handler om undersøgelsen af rummet som lysende armatur og adaptive lyssituationer i test installationer. Undersøgelsene analyseres og diskuteres i bogen *Adaptivt lys*.

Makro skala, – LEDlys som ny belysningskomponent i byrummet. Projektet arbejder med en mapping metode, hvormed byens oplevede belysning anskueliggøres i relation til den overordnede planlægning af gadebelysning. Projektet anvender København som case. Metoden belyses i bogen *På tværs af Københavns gadebelysning 2014*.

I det projekt, som udmønter sig her i denne publikation, har vi interesseret os for den stigende brug af LED som lyskilde i byens rum, og hvordan anvendelsen af LED i byens gadebelysning kommer til at forme oplevelsen af gaden. Undersøgelserne tager udgangspunkt i en „mapping“ af Københavns Kommunes gadebelysning, som den var i forsommeren 2014. Resultatet betragtes som en art overblik og fastholdelse af Københavns gadebelysning, som den var under projektperioden med sigte på at diskutere betydningen af de kommende tiltag med LED.

I forbindelse med projektarbejdet rettes der tak til fagkoordinator for belysning i Københavns Kommune, Thomas Maare, professor i byplanlægning Jens Kvorning, Freddy Degn/Philips, Claus Jensen/Louis Poulsen samt de øvrige deltagere i projektet LEDlys; Interdisciplinær LED lysforskning.

Karin Søndergaard

Mezzo scale, with a focus on architectural space as a luminaire. These practice-based studies are divided into two foci. One concerns the integration of dynamic artificial lighting and daylight, which is unfolded in the book called *An Exploration Into Integrating Daylight and Artificial Light via an Observational Instrument*. The second is about an inquiry of space as a luminous luminaire, as well as adaptive lighting situations in test installations. The studies are analysed and discussed in the book entitled *Adaptive Lighting*.

Macro scale, with LED lighting as a new lighting component in urban spaces. This project works with a mapping method in which the lighting experienced in the city is visualised in relation to the overall planning of the street lighting. The project uses Copenhagen as a case study. The method is illustrated in the book *Into a Mapping of Copenhagen Street Lighting 2014*.

In the project unfolded in this publication, we have taken an interest in the increasing use of LEDs as a light source in urban spaces, and the ways that the application of LEDs in the city's street lighting will shape the experience of the street. The studies are based on a mapping of the street lighting in the Municipality of Copenhagen as it existed in the early summer of 2014. The results are considered as a kind of overview and conservation of Copenhagen's street lighting as it existed during the project in order to discuss the importance of the next initiatives to be undertaken using LEDs.

In connection with the work undertaken throughout the project, we would like to thank Professor of the Technical Coordinator of Lighting at the Municipality of Copenhagen, Thomas Maare, Professor of Urban Planning Jens Kvorning, Freddy Degn/Philips, Claus Jensen/Louis Poulsen, and all the LED Lighting; Interdisciplinary LED Lighting Research project members .

Karin Søndergaard

# Introduktion

De deltagende forskere og undervisere i makro skala LEDlys projektet er lysdesigner og adjungeret professor ved Kolding Designskole, Jesper Kongshaug, projektleder hos OSRAM, Claus Asp samt, arkitekt og lektor i arkitektonisk belysning ved Arkitektskolen, Katja Bülow. Jesper Kongshaug og Claus Asp har begge stor erfaring med belysningsdesign i praksis og undervisning i belysningsdesign på bl.a. på Designskolen, mens Katja er forskningsuddannet underviser på Arkitektskolen. Denne kombination af faglige baggrunde har været drivkraften i udarbejdelsen af en „mapping“ af LED i Københavns byrum.

I begyndelsen af projektet holdt LEDlys forskningsgruppen et fælles seminar, hvor følgende temaer for LED i makro skala blev formet; „adaptation“, „sproget“, „brugere“, „poesi“, „LED i København“. Gruppen var interesseret i at finde ud af, hvordan LED tilpasser sig den store skala, om der mon opstod et nyt lysspørg med brugen af LED, hvad den stigende brug af LED ville betyde for byens brugere, og hvordan der kan være tale om poesi med LED i byens rum.

LED i København blev et tema, da gruppen ønskede at få ’hands-on’ med oplevelsen af LED i byrum, der skulle kunne opleves på stedet. Det skulle senere vise sig, at et storstilet belysningsprojekt for udskiftning af gadebelysningen i Københavns Kommune var på vej. For at nå målet om at blive CO<sub>2</sub>-neutral hovedstad i 2025, var det blevet vedtaget at udskifte så godt som 50 % af kommunens gadearmaturer til nye armaturer med LED inden 2016. Dette gjorde gruppen interesseret i at undersøge selve Københavns gadebelysning, og hvordan LED indgår som lyskilde i denne som udgangspunkt for at forstå, hvordan LED optræder som lyskilde i byens rum.

Undersøgelsen af Københavns gadebelysning er foregået gennem forskellige registreringsøvelser, der tilsammen udgør en mapping. I denne publikation formidles arbejdet omkring den mapping, som blev

# Introduction

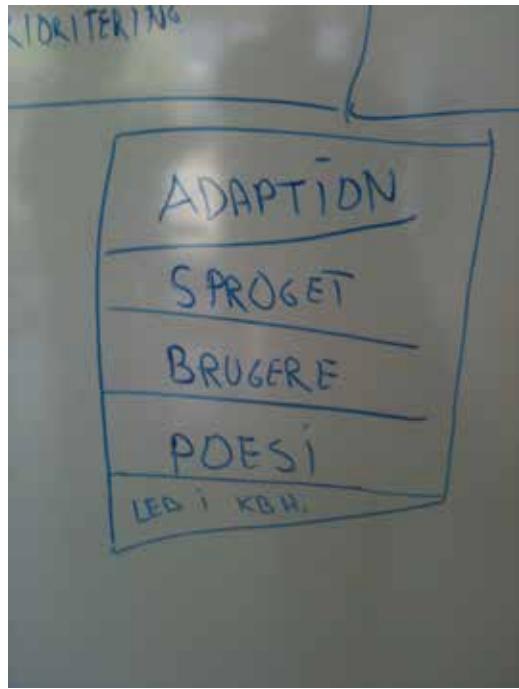
The participating researchers and teachers in this macro scale LED project are: Lighting Designer and Affiliate Professor at the Kolding School of Design, Jesper Kongshaug; Project Manager at OSRAM, Claus Asp; and Architect and Associate Professor in Architectural Lighting at KADK, Katja Bülow. Both Jesper Kongshaug and Claus Asp have extensive experience in lighting design practice as well as teaching lighting design at the Design School (now known as KADK), whilst Katja is a research-trained educator at the School of Architecture (KADK). This fertile combination of backgrounds has been the driving force in the development of a mapping of LED lighting in Copenhagen’s urban spaces.

At the beginning of the project, the LED Research Group held a joint seminar where the following topics for LEDs in macro scale were formed: “adaptation”, “nomenclature”, “users”, “poetry”, “LED lighting in Copenhagen”. The group interest lay in discovering: how LED lighting adapts to the large scale; if a new nomenclature of light would occur with the use of LEDs in urban spaces; what the increasing use of LEDs would mean for the city’s users; and how to unfold poetics when using LEDs in urban spaces.

LED lighting in Copenhagen became a theme since the group wanted to gain ‘hands-on’ experiences with LEDs in civic spaces that could be encountered on-site. In the process of our project definition and developments, it concurrently occurred that a large-scale lighting project involving the replacement of street lighting in the Municipality of Copenhagen was announced as forthcoming. To achieve the goal of becoming CO<sub>2</sub>-neutral capital by 2025, the decision had been made to replace nearly 50% of the municipal street luminaires by 2016; replacing them with new luminaires fitted with LEDs. This led the group to becoming highly interested in examining Copenhagen’s street lighting and the ways that LEDs form light sources in these contexts. This became a point of departure for understanding LEDs as light sources in urban spaces.

foretaget af Københavns gadebelysning i forsommernes 2014, en del af  
selve mapping-materialet og et afsluttende essay om lyskultur og LED i  
København.

The investigation of Copenhagen's street lighting has been undertaken through various registration exercises, which together form a mapping. In this publication the work is disseminated around the mapping, which documents and analyses Copenhagen's street lighting as it existed in the early summer of 2014. The mapping materials themselves, as well as a concluding essay about Copenhagen's lighting culture relative to the advances of LEDs, are also included in this publication.



*Makro skala temaer formet ved første seminar, august 2012*

*Macro scale themes devised at the first seminar, August 2012*

# Mapping som forskningsmetode

„To map“ betyder på dansk „at kortlægge“. Kortlægning er betegnelsen for: „at kortlægge et geografisk (el. astronomisk) område; jævnfør kartografi; det at indtegne el. lokalisere noget på et geografisk (el. astronomisk) kort; systematisk og grundig undersøgelse og beskrivelse.“ (sproget.dk). Den urbane landskabsarkitekt James Corner udtrykker udførelsen af kortlægning så præcist som dette: „Mapping is a fantastic cultural project, creating and building the world as much as measuring and describing it.“ (Corner, 1999, s.213).

Lige så optagede vi er af at bebygge vores verden, lige så optagede er vi også af at kortlægge den. Kartlægning, og resultaterne deraf, gør os klogere på vores omverden og kommunikation om den mulig. Vi gør brug af kort i mange forskellige sammenhæng og oftest i kommunikations-situationer, hvor et kort, stedsbetegnelser og signaturer giver overblik over et fysisk landskab, områder, destinationer og afstande. Der er altså med mapping tale om en kommunikationsform mellem forskellige parter, den part, der producerer kortet og den, der aflæser det. Det handler om kommunikation via et udvalgt og bearbejdet ekstrakt af de fysiske omgivelser i aflæsningsbar form.

I en samtale med professor Jens Kvorning om mapping, og James Corner's metoder til at mappe, nævner han en for „mappere“ vigtig pointe: „it is not the map – it is the mapping“. Han henviser til bogen „Else/Where: Mapping – New Cartographies of Networks and Territories“, hvor „map“ versus „mapping“ introduceres som en væsentlig forskel mellem det komplette, færdiggjorte kort, vs. kortlægning som en proces, der er vedvarende, ufuldstændig og i en ubestemt og muterende form. På et kort måles og gøres notationer, mens man med kortlægning – og her med James Corners ord, har at gøre med: „a collective enabling enterprise“, (Abrams & Hall, 2006, s.12), hvilket på dansk kan oversættes med: „et samlet hele, der gør i stand til fremadrettet initiativ.“

# Mapping as Researching Methodology

In Danish ‘at kortlægge’ means ‘to map’, denoting: “to examine and describe systematically and thoroughly; to plot; to locate on an existing geographical or astronomically map; to identify, to chart, to survey”. (sproget.dk). In addition, the term ‘mapping’, is precisely expressed by the urban landscape architect James Corner: “Mapping is a fantastic cultural project, creating and building the world as much as measuring and describing it”.(Corner, 1999, p.213).

As occupied as we are with building our world, so too, are we with mapping it. Mapping and their resultants enable us to be wiser about our surroundings and in communicating what is possible. We make use of maps in many different contexts and often in communicative situations, where a map and its place names and legends provide an overview of a physical landscape, areas, destinations, and distances. Thus, with a mapping one can speak of a form of communication between different parties; between the person who is creating the map, and the reader. This includes the communication which occurs via a designated and processed extract (isolation) of the physical environment in legible form.

In an interview with Professor Jens Kvorning concerning mapping and James Corner's methods for mapping, he mentions one of the most important points about mapping: “it is not the map - it is the mapping”. He refers to the book ‘Else/Where: Mapping – New Cartographies of Networks and Territories’, where ‘map’ versus ‘mapping’ is introduced as a significant difference between the complete, finished map and mapping as a process that is ongoing, incomplete, and of an indefinite mutating form. On a map, one makes measurements and notations, whilst one who is mapping – in James Corner's words – is engaged with “a collective enabling enterprise”(Abrams & Hall, 2006, p.12).

Mapping stykkes sammen af flere dele, og udtrykker i sin sammenhæng et hele, der gør det muligt at forstå og handle i forhold til et sted. I James Corners klassiske tekst, „The Agency of Mapping: Speculation, Critique and Invention“, gives eksempler på hvordan forskellige former for kortlægning af verden er udtryk for en særlig iagttagelsesposition og metode til at skabe et kort. Som eksempel giver han kunstneren Joaquin Torres-Garda, der i 1943 laver tegningen „Inverted Map of South America“. På denne tegning ses Sydamerikas velkendte profil på hovedet og giver hermed et praj om, at den nordvendte position for en kortlægning ikke er en selvfølge. Tegningen fungerer i kraft af den forståelse som findes, i relation til det nordvendte udgangspunkt for frembringelsen af et kort, og på den måde skaber kunstværket en kobling mellem tegningen og en vedtagelse, som findes udenfor selve tegningen.

Mapping kan bruges i forbindelse med flere forskellige slags discipliner. James Corner er optaget af, hvordan mapping er en kreativ proces, der kan bruges til at undersøge et steds særlige potentiale som led i en planlægningsproces. Eksemplerne på mapping i bogen „Else/Where: Mapping – New Cartographies of Networks and Territories“ er foretaget indenfor mange forskellige discipliner, som viser hvordan mapping i sig selv kan koble mange forskellige lag. Disse eksempler viser mapping som både kunstneriske og forskningsorienterede øvelser. Ligesom Joaquin Torres-Gardas tegning af det omvendte Sydamerika tilvejebringer den kunstneriske mapping nye perspektiver på oplevelsen af vores virkelighed, mens den forskningsorienterede øvelse bruger mapping som metode til at undersøge og skærpe et undersøgelsesfelt.

Det, der gør mapping velegnet som metode i forhold til undersøgelse af Københavns gadebelysning er, at mapping er en kreativ disciplin,

The act of mapping is pieced together from multiple parts, and in its context expresses a whole which makes it possible to understand and act in relation to a place. In James Corner's classic text 'The Agency of Mapping: Speculation, Critique and Invention', examples are provided regarding how different forms of mapping the world can be seen as an expression of a particular observational position and as methodology for creating a map. As one example, he discusses the artist Joaquin Torres-Garda, who in 1943 made the drawing entitled 'Inverted Map of South America'. This drawing shows South America's well-known profile turned upside down, and thereby signals that the north-facing position for a mapping should not be taken as a given. The drawing functions through questioning the preconception that exists in relation to the 'north-is-up' starting point for the creation of a map, and in that way the artwork also creates a link between the drawing and an assumption that exist outside the drawing itself.

Mapping can be used as a method within different kinds of disciplines. Amongst other things, James Corner is concerned with how mapping is a creative process that can be used to investigate a place's unique potentials as part of a planning process. The examples of mappings in the book 'Else/Where: Mapping – New Cartographies of Networks and Territories' are carried out in a variety of disciplines, which illustrate how mapping itself can connect numerous different layers of information and meaning. These examples show mapping as both artistic and research-oriented exercises alike. Like Joaquin Torres-Garda's drawing of an inverted South America, an artistic mapping brings forth new perspectives on one's experiences of reality; whilst a research-oriented exercise employs mapping as a methodology for examining and sharpening a field of inquiry.

hvorigenem LED i den store skala kan undersøges som et oplevet kompositorisk element. James Corner nævner et sæt operative tilgange i sin artikel om mapping og en overordnet struktur, som enhver mapping må indeholde, disse er:

1. Fields
2. Extracts
3. Plottings

Selve mapping-øvelsen kræver stillingtagen til afgrænsning og etablering af et system indenfor hvilket kortlægningen foretages (fields), enkeltstående undersøgelselementer (extracts) og en ny sammensætning som laver kobling mellem det undersøgte (plottings).

What makes mapping a suitable modus operandi in relation to the examination of Copenhagen's street lighting is that mapping is a creative discipline through which LED can be investigated as an experienced compositional element in the large scale. In his article on mapping, James Corner mentions a set of operative approaches and an overall structure that any mapping must contain, and these are:

1. Fields
2. Extracts
3. Plottings

The mapping exercise itself requires: evaluations about demarcation, and the establishment of a system within which the mapping is made (fields); individual elements of investigation (extracts) and a new constellation that creates connections between the things and places being examined (plottings).

# Mapping af Københavns gadebelysning 2014

For at finde et fælles fundament for LED Makro skal gruppens deltagere at fungere ud fra, blev der i sommeren 2012 foretaget en ekskursion for at se på LED i København. På denne ekskursion var LED at finde i form af gade- og pladsbelysning, tunnel- og facadebelysning, reklameskærme, adaptivt løbelys og kulørte indslag i forskellige by- og parkrum. At så godt som alle LED eksempler i København kunne nås på en aften viste at LED i byen, på tidspunktet for ekskursionen, blot var i sin vorden. Henad vejen udviklede ekskursionerne sig til registreringer af LED versus andre slags lyskilder i forskellige typer byrum, og det blev klart, at LED langt hen af vejen skal klare sig som erstatningslyskilde for byens eksisterende lyskilder – i alt lige fra lysreklamer til gadebelysning, og at funktionen i mange tilfælde vil blive belysning af byens rum.

Den tildelte skala, makro skala, var dog den, der så ud til at rette gruppens arbejde hen mod LED i relation til gadebelysning. I denne store skala handler det om flydende rum, rum på rum, systemer og store geografiske områder. Den kommende udskiftning af Københavns gadebelysning fangede gruppens opmærksomhed, fordi der netop her er tale om planlægning af belysning som et i byen gennemgribende element. Der er her ikke tale om et tilfælde af belysning i et enkeltstående byrum, men om belysning, der fungerer som system gennem byens forskellige gader og byrum.

I skrivende stund fremtræder belysningen fra Københavns Kommunes gadelamper som et forunderligt 'kludetappe' af forgangne tiders brug og planlægning. I den wire-ophængte belysning præger „Københavner-

# Mapping Copenhagen Street Lighting 2014

In the summer of 2012, in order to establish a common working foundation, the members of the LED Macro Scale Group undertook a field-study to look at examples of LED lighting in Copenhagen. On this field-study, LEDs were encountered in the form of street and area lighting, tunnel and facade lighting, lighting in advertising displays, adaptive light for running, as well as coloured light in various urban and park spaces. The fact that virtually all of the urban LED examples in Copenhagen – at the time of that excursion – could be reached in a single evening reflects the fact that LEDs in the city were only in their infancy. In the process of developing our research, further fieldstudies developed into sessions focused on registering LEDs versus other types of light sources in numerous types of urban spaces. And in doing so, it became clear that LED lighting would soon succeed as a replacement light source for the city's existing light sources in the long run; including everything from neon signs to street lighting, and in many cases the function would be for the illumination of urban spaces.

The macro scale given, seemed to become the clue to the direction towards LEDs being adapted into street lighting and the urban scale. The wider scope of the macro scale is about fluid space, space to space, systems and large geographical areas. The imminent replacement of Copenhagen's street lighting with LEDs caught the group's attention because it was precisely here that the planning of lighting could be poised as a radical element. This is not a case of lighting a singular urban space, but of lighting that works as a system throughout various city streets and urban spaces.

lampen“ en stor del af gaderne, mens indførelsen af nyere lampetyper med opal skærm er at finde mange steder. Gadelamerne opträder med forskellige typer lyskilder, der gennem tiderne har skulle leve op til belysningstyrken i henhold til vejbelysningsregler, spare mest mulig energi og opnå bedst mulig belysningskvalitet. Lyskildeudskiftningen har været en øvelse, der har stået på i mange år, men man er aldrig blevet ’færdig’ og nået til at have samme type lyskilde i hele det wire-hængte belysningssanlæg. Der er således både metalhalogen, højtryksnatrium og LED i anlæggets forskellige typer armaturer.

Dette brogede udgangspunkt kaldte på overblik samtidig med, at vi ville ned i gaderne og ud i byens rum for at observere, hvordan LED indgår som lyskilde i gadebelysningen. Overordnet er der arbejdet med at lave et kort, der viser den samlede fordeling af lyskildetyper i Københavns Kommunes vejnet, og videoregistrering af forskellige ruter gennem Københavns gader. En af ruterne er fotoregistreret og tilføjet data vedr. lyspunkterne i gadebelysningen. Sammenlignes de bearbejdede elementer med James Corners mapping-temaer, så er „the field“ gaderne i Københavns Kommune, „the extracts“ er de wire-ophængte lyspunkter og deres data. „The plottings“ er de wire-ophængte lyspunkter i relation til gaden som byrum. Her møder systemet den enkelte gade og alt det, der foregår i den.

At the time of this writing, the lighting from the Municipality of Copenhagen's street lamps appears as an astonishing ‘patchwork’ as a result of the past's uses and planning. In terms of the wire-suspended lighting, it is the ‘Copenhagen Lamp’ that characterises a large portion of the city's streets. At the same time, the introduction of new types of lamps with opal diffusers, can be found in many places. The street luminaires appear with different types of light sources, which over the years have had to live up to the lighting levels requirements according to the street lighting regulations. They saved the most energy at that time and achieve the best possible lighting quality. The replacements of the former light sources in the wire-hung street luminaires has been an ongoing exercise for many years, yet has never been finished; with the Municipality not yet managing to outfit the same type of light source in all the wire-hung luminaires. Consequently, there are metal halide, high pressure sodium, and LED light sources in the numerous lamp types of the system.

This variegated point of departure called for an overview, concurrent to us wanting to explore first-hand by walking down the streets and into the civic spaces to observe how LED form part of the street lighting as light source. Overall, the efforts have been made to create a mapping that shows the comprehensive distribution of the various types of light sources in the Municipality of Copenhagen's road network. And as part of this, video recordings have been made of different routes through the streets of Copenhagen. One of the routes has been photographically registered and has had data added to it regarding the point sources in the overall street lighting. Comparing these processed elements with James Corner's mapping themes, then the ‘fields’ can be understood as the streets of Copenhagen, the ‘extracts’ as the wire-mounted point sources and their data, and the ‘plotting’ as the wire-mounted point sources in relation to the street as an urban space. Here the system meets the individual street and everything that is going on within the given street.

Den samlede mapping består således af følgende materiale:

### Kortet

- Et oversigtskort over Københavns Kommunes lyskildetyper

### Ruterne på tværs

- 3 videooptagelser gennem byen, 1 gårute af  $\frac{1}{2}$  times varighed, 1 cykelroute på  $1\frac{1}{2}$  times varighed og 1 bilroute på 1 times varighed
- Fotos taget gennem den videooptagede cykelroute

### Data

- Data vedr. lyspunkterne

### Skrivearbejde om...

- Skrivearbejder om LED i København

The total mapping material consists of the following:

### The Map

- An overview map of the Municipality of Copenhagen's types of urban light sources

### Into the Map

- Three video recordings through the city: one pedestrian route of a half hour duration; one cyclist route lasting one and half hours; and one motorist route of an hour's duration
- Photographs taken along the video recorded cyclist route

### Data

- Point source data

### Writings on...

- Writings on the experience of LED lighting in Copenhagen

# Kortet

Oversigtskortet over Københavns Kommunes lyskildetyper er baseret på et allerede eksisterende kortset over kommunens lyskilder, stillet til rådighed af Københavns Kommune, Teknik og Miljøforvaltningen - Trafik. Kortsættet er udarbejdet i sommeren 2013 af døværende leverandør af gadebelysning, Eltel Networks A/S og Teknik og Miljøforvaltningen, Københavns Kommune. Kortsættet er del af udbudsmaterialet til kommunens nye belysning og giver i sit samlede hele information om fordeling af samtlige lyskildetyper i Københavns Kommune.



Oversigt over udbudsmaterialets kortfiler

Kortsættets pdf-filer er vektorbaserede, hvilket gjorde det muligt at arbejde med kortene i forskellig storrelse og med deres lag, som bl.a. bestod af vejnet, priksignatur for forskellige typer lyskilder og farvesignatur for henholdsvis vandområder og grønne områder. I disse kort var der potentielle for at skabe et nyt kort, som gav det samlede natte-lyskilde-billede af Københavns gadebelysning. Det bearbejdede kort er ved hjælp af digitale midler 'vendt på vrangen' i forhold til det oprindelige kortset

# The Mapping of the Map

The mapping is based on an existing set of maps of Copenhagen Municipality's light sources, which was supplied by the Municipality's Technical and Environmental Administration. The set of maps was prepared in the summer of 2013 by the then supplier of the street lighting, Eltel, in concert with the Technical Administration of Copenhagen Municipality. The set of maps was part of a tender document for the city's new lighting, and in its totality it provides information about the distribution of all the urban light source types in Copenhagen.

1. Other light sources pole or wire
2. CDO, metal halid, pole or wire
3. Yellow flash light
4. Hna, high pressure sodium, pole or wire
5. HPL HG, mercury, pole or wire
6. LED, pole or wire
7. Fluorescent light
8. Park lamps
9. 20.000 light points to be replaced

Overview of the procurement material's map files

The maps in the PDF files were vector-based, making it possible to work with the maps in varying sizes and utilising their diverse layers. The layers consisted of road networks, dotted marks designating different types of light sources, and a colour-coded legend designating water bodies and green areas respectively. In these maps, lay the potential to create a new mapping that could provide a compressive picture of the (night) light sources in Copenhagen's street lighting. In relation to the original set of

og samler så godt som alle lyskildetyper i ét kort. Kortet er gjort til et nattekort ved at gøre hvid baggrund til sort, sorte vejlinjer til hvide og ændre opaciteten i vandområdernes blå signatur og de grønne områders grønne signatur, så de bibeholder farven – men dæmpet, som farven ville opleves i nattebelyst mørke. Farverne på priksignaturerne er ændret, så de kan aflæses i forhold til hinanden i det mørke, samlede lyskildekort. Hvor der skelnes mellem stander og wire-hængte lyspunkter i det oprindelige kortsæt, gøres der i LED makro skala kortet ikke forskel på de to gadebelysningsformer.

Kortøvelsen gjorde opmærksom på, hvordan vandrums og grønne områder tegner byens rum, også om natten, og hvordan vejnettet befinder sig mellem disse rum. Det samlede lyskildekort er et stor-skala kort, hvor gader i forhold til bygningsvolumener ikke fremgår. Det er priksignaturerne, der tegner gaderummene i denne skala og skaber et karikeret billede af byens samlede lyskildefordeling. Det karikerede billede gør det tydeligt at se, hvilken udbredelse LED har på tidspunktet for mappingen – hvilket omfang der er tale om, og hvor denne type lyskilder befinner sig henne. Det ses også hvordan LED placerer sig i forhold til byens øvrige lyskildetyper, hvilken type der er mest af og hvordan de fordeler sig i forhold til hinanden.

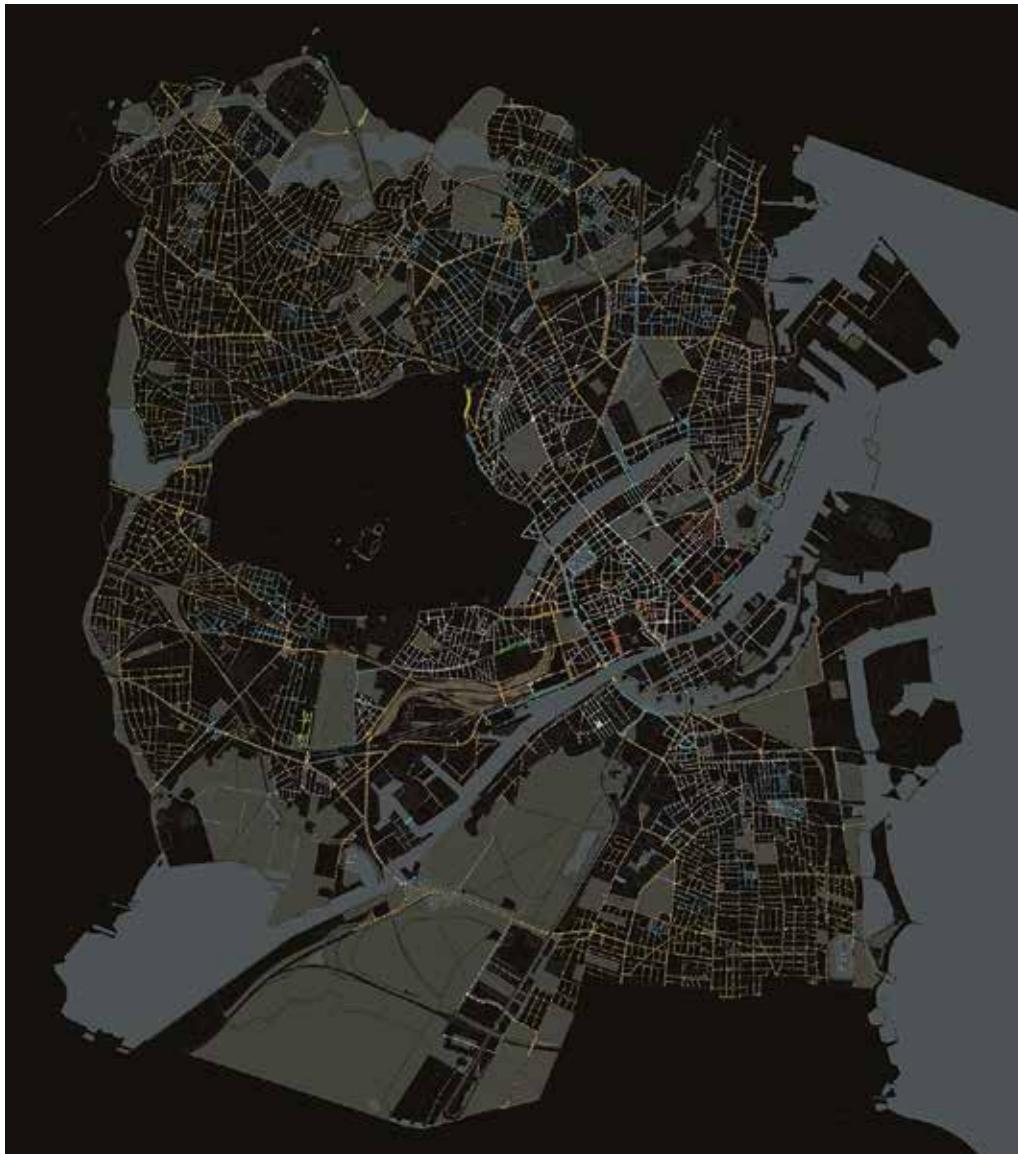
maps, and with the help of digital means, the new mapping was – metaphorically speaking – turned inside out. And it gathers all the various types of light sources in one single map. The mapping was devised as a night mapping by inverting the white background into black and by making the black road markings white. The opacities in the colour-coded legend for the blue of the water bodies and the green of the vegetal areas were also changed so they would retain their colours – albeit, a bit subdued just as when one experiences them in night-lit darkness. The colours of the dotted marks for the light sources were changed so that the light sources may be read in relation to one another in the darkened comprehensive light source mapping. Where a distinction has been made between pole-mounted and wire-suspended point sources in the original maps, the mapping of the LED macro scale research project has elected not to make a distinction between these two types of street lighting.

The mapping exercise drew our attention to, amongst other things, understanding how water spaces and green areas shape the city's urban spaces, even at night. We became additionally aware of how the road network is situated between these spaces. The comprehensive light source map is a large scale map, where the streets in relation to the buildings have been omitted. It is thus the dotted marks representing the light sources that shape and demarcate the street spaces at this scale, and which also create a rough picture of the city's overall distribution of light sources. This rough picture makes it easy to see what kind of dissemination LEDs had at the time of the mapping – that is, to see the extent of LEDs and how and where they were positioned and utilised in 2014. Moreover, one can also see how LEDs are positioned in relation to the city's other types of light sources; which types there are the most of and how they are distributed in relation to one another.



Kortfilen „LED med i wire“, LED på mast og i wire, Peter Rosenstand Eltel Networks A/S og Teknik og Miljøforvaltningen, Københavns Kommune, 2013

Map file “LED med i wire”. Source: Peter Rosenstand ELTEL and the Municipality of Copenhagen’s Technical Management Administration, 2013



Signaturforklaring til kortet/  
Map Legend

- Højtryksnatrium / High Pressure Sodium (Hna)
- Metalhalogen / Metal Halide (CDO)
- LED
- Kvicksolv / Mercury (HPL Hg)
- Lysstofrør / Fluorescent tube
- El-gas / Imitated gas
- Helios pladsarmatur / pole-mounted luminaire, especially used in squares and parks

Kortet – „På tværs af Københavns gadebejlsning 2014“

Mapping – ‘Into a Mapping of Copenhagen Street Lighting 2014’

## Ruterne på tværs

Det er kortets samlede lyskildebillede – ’kludetæppet’ af forskellige lyskildetyper, der dykkes ned i med video- og fotooptagelserne. Der kombineres her mellem kortets karikerede formidling af gaderenes lyskildefor deling og den detaljerede formidling, som video og foto frembringer på forskellig måde. Videooptagelserne gennem Københavns gader blev foretaget med action kameraet, GoPro HD HERO2, som blev monteret på hovedet af den, der bevægede sig gennem gaderne. Fotooptagelserne blev foretaget med et Canon EOS 5D Mark II, et kamera med en stærk sensor og et bredt dynamik område i forhold til optagelse af luminansforskelle.

Videooptagelserne blev foretaget på en måde, der kunne minde om den form for „dérive“ gennem byen, som James Corner beskriver. En „dérive“ er en uforudsigelig tur gennem byen, hvor omgivelsernes arkitektur og geografi via underbevidstheden dirigerer den, der bevæger sig gennem byen. Situationisten Guy Debord siger om termen „dérive“: „a mode of experimental behavior linked to the conditions of urban society: a technique of rapid passage through varied ambiances.“ (Debord, 1958). Det guidende element i projektets „dérives“ var ambitionen om at spænde mellem byens yderområder og en rig variation af gader gennem byen; klassiske boliggader, strøggader, brede boulevarder og at bevæge sig gennem så mange forskellige typer lyskilder og armaturer i den wireophængte belysning, som kunne nås på ca. 1 time. Ruterne er altså en art komposition, skabt i bevægelse mellem ydre og indre områder, på tværs af bydele, vejklasser, armaturer og lyskildetyper.

Gåturen, cykelturen og bilturen er forskellige ruter, men de kommer alle gennem nogle sammenfaldende steder undervejs. Idet turene er foretaget som „dérives“, kunne de have været mange andre, end dem der er foretaget. Men den variation der optræder, er genkendelig for gadernes variation gennem København. Karakteristisk for GoPro optagelserne er billedvinklen på 170°, hvilket betyder at næsten hele synsfeltets blik

## Into the Mapping

It is the mapping's overall image of the light sources – the ‘patchwork’ of the different types of light sources – that is probed in the photographs and video recordings. Here, there exists a combination of the mapping's rough dissemination of the streets' light sources and a detailed dissemination provided by the videos and photographs in different ways. The video recordings through the streets of Copenhagen were created using an action camera, GoPro HD HERO2, which could be mounted to the head of the person moving through the streets. The photographic registrations were made with a Canon EOS 5D Mark II; a camera with a powerful sensor and a wide dynamic range for shooting luminance differences.

The video recordings were made in a manner reminiscent of a kind of ‘dérive’ through the city, as described by James Corner. A dérive can be thought of as an unpredictable trip through the city where ambient architecture and geography subconsciously direct one's movements. Situationist Guy Debord states that the term dérive is: “a mode of experimental behaviour linked to the conditions of urban society: a technique of rapid passage through varied ambiances (Debord, 1958). The guiding element in the dérives of our project was the ambition to span between the city's outlying areas, on the one hand. And on the other hand, to progress through a rich variety of inner city streets (such as traditional local streets, shopping streets, and wide boulevards), whilst moving amongst as many different types of wire-suspended street lighting as could be reached in approximately one hours' time. The routes are all one sort of composition that is in motion between outer and inner areas, across different city boroughs and road type classifications, as well as moving between various types of luminaires and light sources.

The pedestrian route, the cyclist route, and the motorist route were all singular routes, yet they drifted through some overlapping places along the way. Because the journeys were undertaken as dérives (drifts), they

repræsenteres på optagelsen. En væsentlig forskel på videooptagelsens billede og det menneskelige synsfelt er, at de yderste 40° ses sløret gennem synsfeltet, men fremstår klart på GoPro optagelsen. Optagelsen viser altså klart de mørke og lyse omgivelser, som blikket i bevægelse blot vil opfatte som skift mellem mørke og lyshed.

VIMEO-link - Cykelruten / the Cyclist Route:  
<https://vimeo.com/116046955>

could have become many others routes instead of those carried out. But the variation that occurred is recognisable with that of the variation of streets through Copenhagen. Characteristic of GoPro filming, the viewing spectrum is a 170° angle, which means that almost the entire field of vision is captured and represented in the recordings. One important difference between the video recorded images and the normative human field of view is that the outermost 40° of human visual perception appears as blurred vision, whereas with the GoPro recordings the extended peripheral vision is clear. The recordings therefore clearly show the dark and bright environments, just as the gaze in motion would perceive them – as shifts between darkness and brightness.



Klip fra bilruten, Amagerbrogade ved Blekingegade.  
 Hurtig fart, indkapslet overblik og eksponering for gadelampernes lys. Fokus på trafikanter på vejbanen.

*Still from the motorist route on Amagerbrogade near Blekingegade: Fast speed, with a compressed overview and exposure to the illumination from the street lights. The focus is on the motorists in the traffic lane.*



Klip fra cykelruten, Amagerbrogade ved Blekingegade.  
 Middelhurtig fart, godt overblik over gadens elementer med fokus på cykelstien og andre trafikanter.

*Still from the cyclist route on Amagerbrogade near Blekingegade: Medium-paced speed, with a good overview of the street's elements and a focus on the bike path (cyclists) and the other people using the street (pedestrians and motorists).*



Klip fra gåruten, Amagerbrogade ved Blekingegade.  
 Langsom fart og fokus på gadens detaljer, fra blikfang i det fjerne til detaljer bag forretningsinduet.

*Still from the pedestrian route on Amagerbrogade near Blekingegade.*

Den videooptagede cykelrute, danner basis for en serie fotooptagelser, der er foretaget gennem ruten. Den videooptagede cykelrute blev foretaget som en „dérive“, mens fotooptagelserne følger den rute, der blev skabt på cykel. Serien blev lavet for at fastholde, og give et mere tydeligt billede af, rutens skiftende stemninger. Optagelsesstederne blev valgt ud fra følgende kriterier; hver gang der på ruten var et tydeligt skift som følge af gadens bredde, den omkringliggende bebyggelse eller gadebelysningens armatur- og lyskildetype, blev der taget et billede. Optagelsesstedet er valgt ud fra den vinkel, der bedst anskueliggør gadens afgrænsede ramme i form af himmel, bebyggelse og vejbane. Der er altså tale om en ’neutral’ optagelse af gaden, der skildrer de forhold, som både den gående, cyklisten og billisten ville møde i gaden, på tidspunktet for optagelsen. Fotooptagelsens billeder er justeret i Photoshop, så de oplevede luminansforskelne optræder på billederne. Fotograferne er taget med en normaloptik på 24-70°, så billedernes udsnit af omgivelserne ligger inde for det man kalder overbliksfeltet i det menneskelige synsfelt. Det er det udsnit man almindeligvis bruger til perspektivtegning og visualiseringer af omgivelserne, da det svarer til det område, der ses klart og tydeligt gennem synsfeltet.

Fotooptagelsens billeder, taget gennem cykelruten, kan ses i denne publikation på de følgende sider. Projektets mapping-materiale er her redigeret til publikationsform, så fotooptagelsernes billeder optræder med kommentarer vedrørende den observerede belysning i 71 opslag, hvor mappingens forskelle dele er samlet; udsnit fra oversigtskortet med position for optagelsesstedet sammen med fotografi af et gadestykke og data vedr. gaden, fotografiet er taget i, og gadebelysningens lyspunkter.

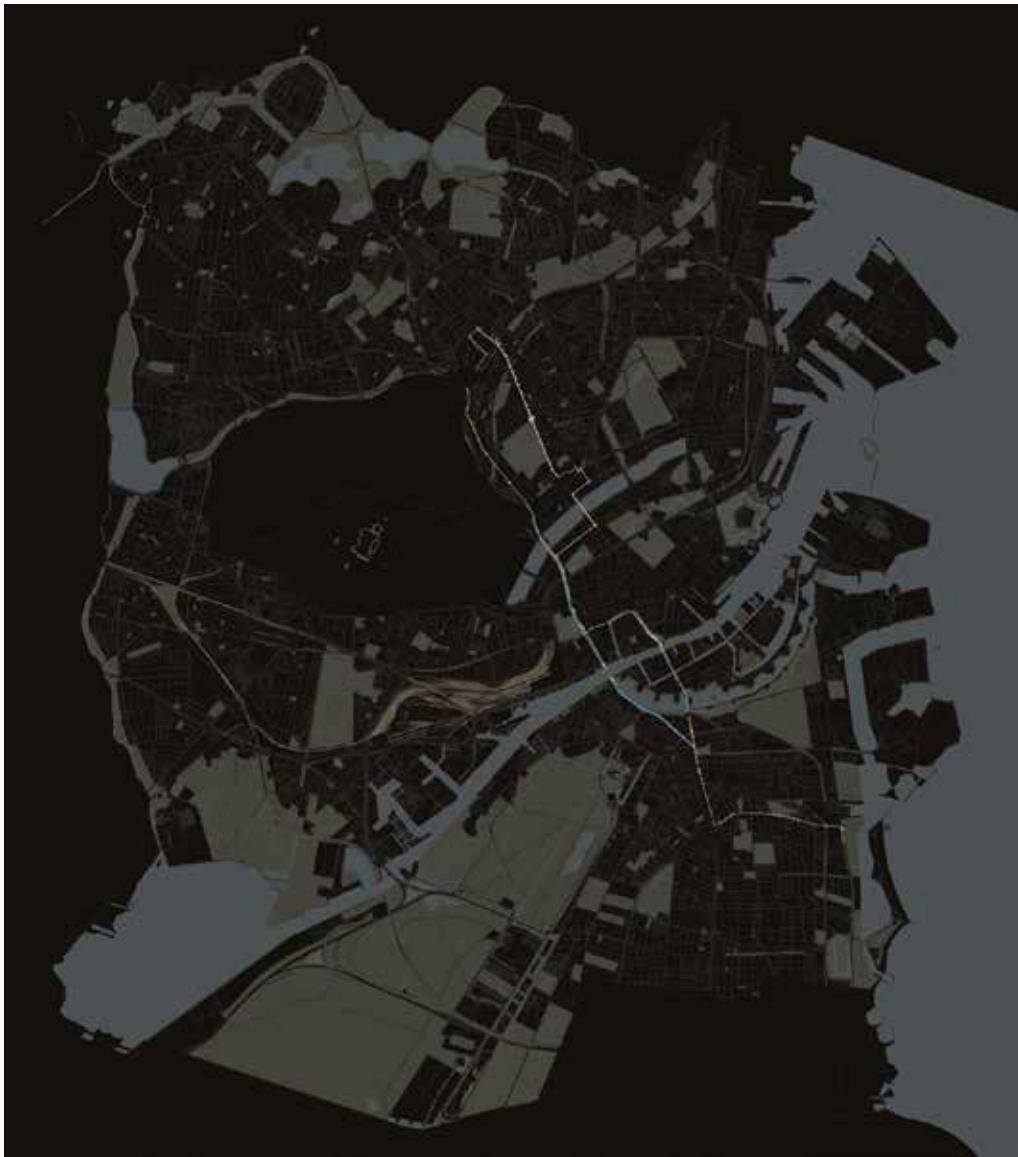
The video recorded cyclist route creates the basis for a series of photographic registrations. The video recorded route was a genuine dérive and occurred before the photographic registrations; with the photographic registrations then following the video recorded cyclist route. The photographic registrations were made in order to provide and maintain and a more lucid picture of the cyclist route’s changing atmospheres. The registration spots were chosen based on the following criteria: a picture was taken along the route every time that one encountered a distinct shift or feature in the street’s width, the surrounding buildings, the street lighting luminaires, and/or the light sources. The photographic angle of each registration spot was chosen based on the angle that would best illustrate the given street’s defined framework in the form of the sky, buildings, and roadways. There is thus a neutral registration of the street, which depicts the conditions that the pedestrian, cyclist, and motorist would have encountered on the street at the time of documenting. It should also be noted that the photographs have been adjusted using Photoshop so that the experienced differences in luminance appear within each frame. The pictures were taken with a normal lens at 24°-70° so that the pictures’ croppings of the surroundings fall within the standard range of the human field of vision. This is the range most commonly used for perspective drawing and visualisations of surroundings, since it corresponds to the area where the surroundings can be seen clearly.

The photographic registrations taken along the cyclist route can be found in the ensuing pages of this publication. Here the project’s mapping materials have been edited into publication format so that the photographic registrations appear with feedback on the lighting observed in 71 entries, in which the entities of the mapping are combined; the night mapping (a section of the large mapping) and the street view photographs together with data on the point sources in the street.

# Opslagenes mapping-indhold

# Contents of the Mapping Entries

Gadebetegnelse / Street designation	Vejklasse / Road category	Kortudsnit / Map section	Foto / Photographs
Amagerboulevard Bydelsgade / Districts Road			
 aarmærke lampe type pære light source LED farve temperatur colour temperature 3000 K farve præsentation colour rendering 70-80 CRI række wire rows 2 udskiftning før 2016 replacement before 2016 nej no			<p>"LED-gadelyningen skaber markant optisk løsning i mørket blandt oplyste vinduer fra "Svinget" boliger"    "the LED street lighting that creates characteristic optical alignment misses with the dark environment and the illuminated windows of the housing at Svinget"</p>
Data / Data		Position for fotooptagelse / view point 	Kommentar / Comment



Signaturforklaring til kortet/  
Map Legend

- Hojtryksnatrium / High Pressure Sodium (Hna)
- Metalhalogen / Metal Halide (CDO)
- LED
- Kviksolv / Mercury (HPL, Hg)
- Lysstofrør / Flourescent tube
- El-gas / Imitated gas
- Helios pladsarmatur / pole-mounted luminaire, especially used in squares and parks

Kortet - med cykelturens rute

Mapping - Cyclist Route

## Data

De indhentede data er den del af mapping-materialet, der er allermest detaljeret. Hvor oversigtskortet viser et karikeret billede af hele gadenettets lyskildefordeling, giver de indhentede data information om gadebetegnelse for den gade som fotooptagelsen er foretaget i, hvilken vejkategori gaden er i og en stribe oplysninger om den gadebelysning, som findes i gaden; armaturtype, lyskildetype, lyskildens farvetemperatur og farvegengivelsesevne, antal wire rækker i gaden, og om lyspunktet udskiftes i forbindelse med Københavns Kommunes belysningsprojekt, der færdiggøres inden 2016. Disse data vil forandres med udskiftningen af lyskilder og armaturer og dermed også gadens udseende – og stemning.

## Data

The data obtained is the part of the mapping material that is most highly detailed. Where the comprehensive overview map shows a rough image of the entire street network's distribution of light source, the acquired data provides information about: the name of the specific street on which each photographic registration was undertaken; the road category that the given street is part of; and a strip of information about the given street's lighting, luminaires, light source types (inclusive of the light sources' colour temperatures and colour rendering abilities), and the number of suspended wire rows. Information regarding the replacement of a point source is also included: informing if it will be replaced

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no

Dataskemaet / Data table

# Cykelrutens armatur- og lyskildetyper

Københavnerlampen/ The ‘Copenhagen Lamp’

Design: Stadsarkitektens Direktorat, sidst 1970 / The Municipal Architects Office, late 1970

Producent/ Manufacturer: Philips



## med reflektor / with a reflector:

Lyskilden er trukket op i armaturet, der afskærmer lyset opad og reflekterer det skrāt nedad med en blød „fall-off“ sammen med det direkte lys fra lyskilden.

The light source is nestled into the fixture, which shields the light upwards and reflects it obliquely downward with a soft ‘fall-off’ together with the direct illumination from the light source.



## med LED / with LEDs

LED-enhederne sidder nederst i armaturhuset, og lyser direkte nedad og udad i en afskåret vinkel.

The LEDs are positioned in the base of the body of the luminaire and illuminate directly downwards and outwards in a reduced angle of distribution.

# Luminaires and types of light sources of the Cyclist Route

Icon Mini Opal

Design: Mads Odgård, 1999

Producent/ Manufacturer: Louis Poulsen



## med reflektor / with a reflector

Lyskilden er trukket op i armaturet, der afskærmer lyset opad og reflekterer det skrāt nedad med en blød „fall-off“ sammen med det direkte lys fra lyskilden. Den opale skærm lyser ved reflekteret lys fra lyskilden.

The light source is nestled into the fixture, which shields the light upwards and reflects it obliquely downward with a soft ‘fall-off’ together with the direct illumination from the light source. The opal screen illuminates via reflected light from the light source.



## med LED / with LED

Lampen indeholder en reflektor, der sender reflekteret lys fra LED lyskilden nedad og skrāt nedad med en blød „fall-off“. Den opale skærm lyser ved reflekteret lys fra lyskilden.

The lamp includes a reflector that directs reflected light from the LED light source downward and obliquely downward with a soft ‘fall-off’. The opal screen illuminates via reflected light from the light source.

Ændringer i gadens lyspunkter kan være et nyt armatur, der fordeler lyset anderledes i gaden, en ny lyskilde med en anden farvegengivelsesevne og farvetemperatur, eller ændring af det antal wirer, der går gennem gaden. Ændringer i disse data vil på forskellig måde ændre gadens udseende, og opslagene kan bruges som reference til at forstå gadebelysningens indflydelse på gadens udseende og stemning samt nogle af de faktorer, som skaber disse.

in connection with the lighting project of the Copenhagen Municipality that is due to be completed by 2016. This data will change along with the development of the new lighting project, and the street's appearance – and atmosphere – will therefore also change.

Changes in a street's point sources may include: a new luminaire distributing light differently onto the street; a new light source with a different colour reproduction capability and colour temperature; and/or a change in the number of the street's suspended wire rows. Alterations in data such as those aforementioned will alter the street's appearance in different ways. And the entries included in this publication can accordingly be used as references for more deeply understanding the influences that street lighting has on a street's appearance and atmosphere.



På tværs af Københavns gadebelysning 2014 – cykelruten  
Into a Mapping of Copenhagen Street Lighting 2014 – Cyclist Route

# Øresundsvej

Bydelsgade / Districts Road



Øresundsvej / Amagerstrandvej

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
mast pole	○ CDO	3000 K	88 CRI	-	nej no

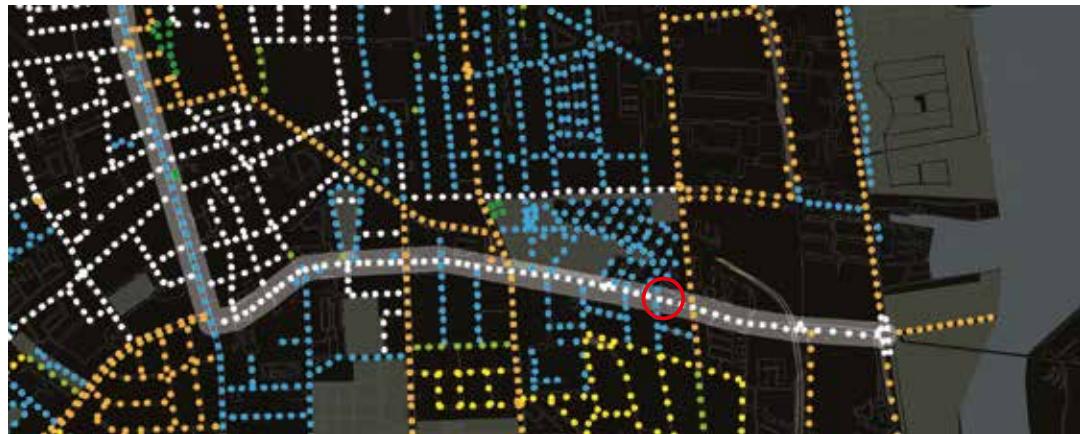


„asymmetrisk gadebelysning kaster lys på „Øresundstårnets“ base“

“light from the asymmetrical street lighting falls onto the base of Øresundstårnet”

# Øresundsvej

Fordelingsgade / Distributor Road



Øresundsvej / Sundparken

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no

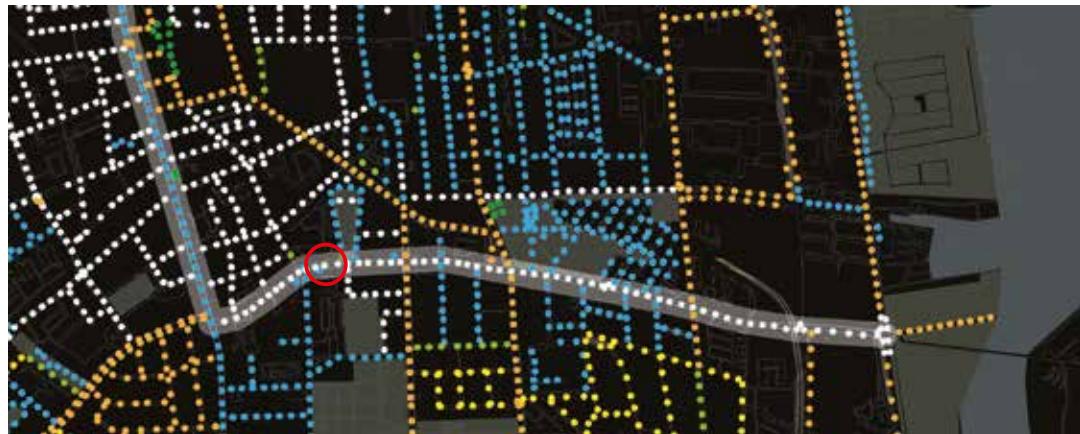


*„ parklygter skaber supplerende lys til gadebelysningen, og gule fodgængerblink vækker opmærksomhed “*

*“ park lamps complement the wire-hung street lighting, and flashing yellow pedestrian lights create visual focus ”*

# Øresundsvej

Fordelingsgade / Distributor Road



Øresundsvej / Spaniensgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no



,, REMA 1000 skiltet lyser op på den mørke facade forude “

“the ‘REMA 1000’ sign is a luminous element appearing in the dark bend ahead ”

# Øresundsvej

Fordelingsgade / Distributor Road



armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no

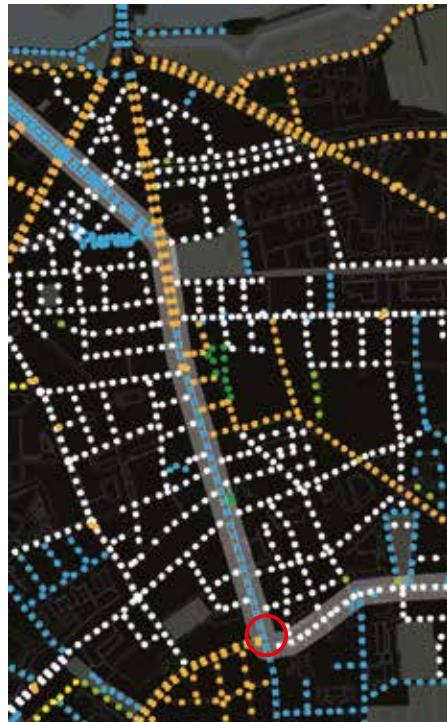


„ lysskiltet med LED skaber bogstaver med kolig hvidhed og præcis lysende afgrænsning “

“ signs using LEDs create illuminated letters of cool whiteness and precision ”

# Amagerbrogade

Strøgade / Shopping Street



Amagerbrogade / Øresundsvej

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	1	nej no

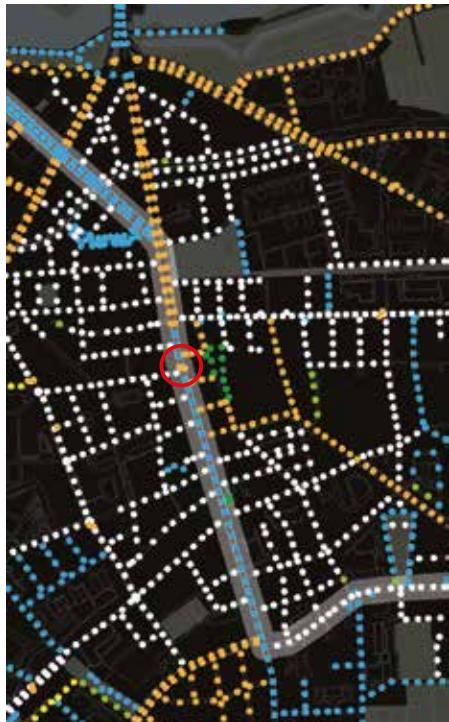


„gadebelysning med LED giver skarp symmetri og spraglede tilføjeler af forskelligt lys fra gadens forretningsfacader“

“street lighting using LEDs provides sharp symmetry together with multi-coloured additions of light being emitted from the shop facades fronting the street”

# Amagerbrogade

Strøgade / Shopping Street



Amagerbrogade ved Blekingegade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	1	nej no

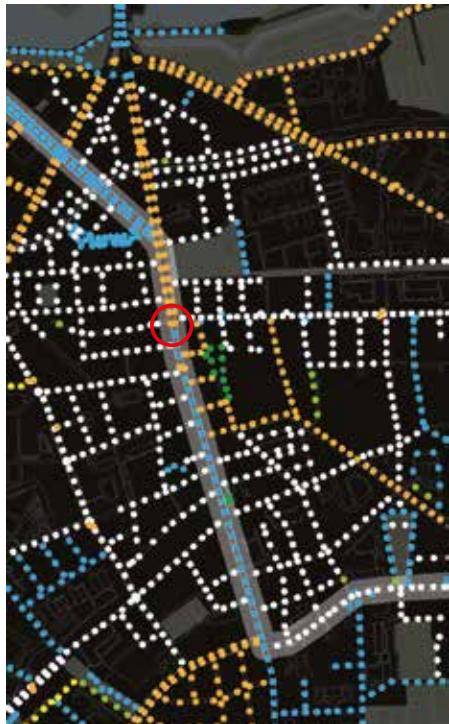


*„lys fra pølsevognen og skiltning skaber elementer af lys i karreens mørke mellemrum“*

*“illumination from the hotdog stand and the illuminated signs create luminous elements within the dark interstitial space of the city block”*

# Amagerbrogade

Strøgade / Shopping Street



Amagerbrogade / Holmbladsgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	2	ja yes



*„ ved Holmbladsgade stopper kølig LED-gadebelejning og varmbojtryksnatrium tager over “*

*“at Holmbladsgade, the cool street lighting using LEDs ceases and the warm illumination of the high-pressure sodium light sources take over ”*





„ 2 rækker gadelamper tillader lyset fra gadebelysningen at nå op ad husene facader “

“ two rows of wire-hung street lamps allow the light to reach the facades along the street ”

# Amager Boulevard

Bydelsgade / Districts Road



Amager Boulevard / Ved Svinget

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*„LED-gadebelysningen skaber markant optisk linjeføring i mørket blandt oplyste vinduer fra „Svingets“ boliger“*

*“the LED street lighting creates characteristic visual guidance and mixes with the dark environment and the illuminated windows of the housing at Svinget”*





*„ den LED-belyste kørebane suppleres af indgangshys enkelte steder “*

*„ in some places the LED-illuminated roadway is supplemented by light emanating from the buildings' entries “*

# Amager Boulevard

Regionalvej / Regional Road



Amager Boulevard / Stadsgraven

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*„boulevardens forløb understreges af LED-gadebelysningens optiske linjeføring“*

*“the directionality of the boulevard is accentuated by the visual guidance of the LED street lighting”*

# Langebro

Regionalvej / Regional Road



armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no

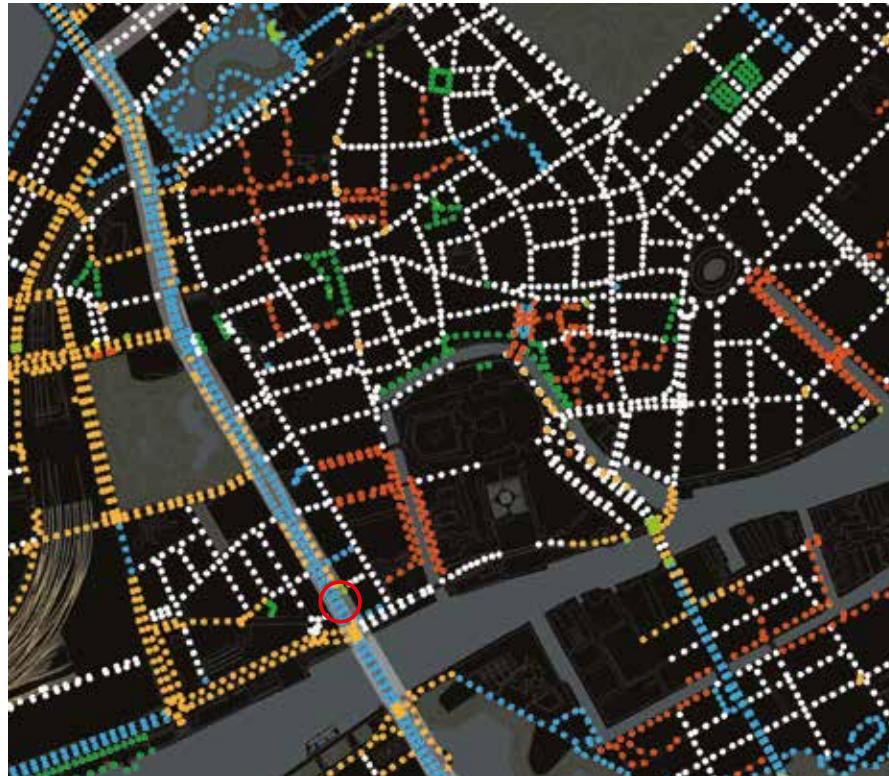


*„kørebanen er godt belyst af LED-gadebelysningen, mens fortovskanterne opleves mørke“*

*“the roadway is well lit by the LED street lighting, whilst the sidewalk appears gloomy”*

# H.C. Andersens Boulevard

Regionalvej / Regional Road



H.C. Andersens Boulevard / Langebro

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*„statelige bygninger langs boulevarden og gadebelysningens optiske linjeføring leder ned mod Richshusets dekoration af neon“*

*“buildings of distinguished character and visual guidance of the street lighting lead towards the neon ornamentation of Richshuset”*

# H.C. Andersens Boulevard

Regionalvej / Regional Road



H.C. Andersens Boulevard / Glyptoteket

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no

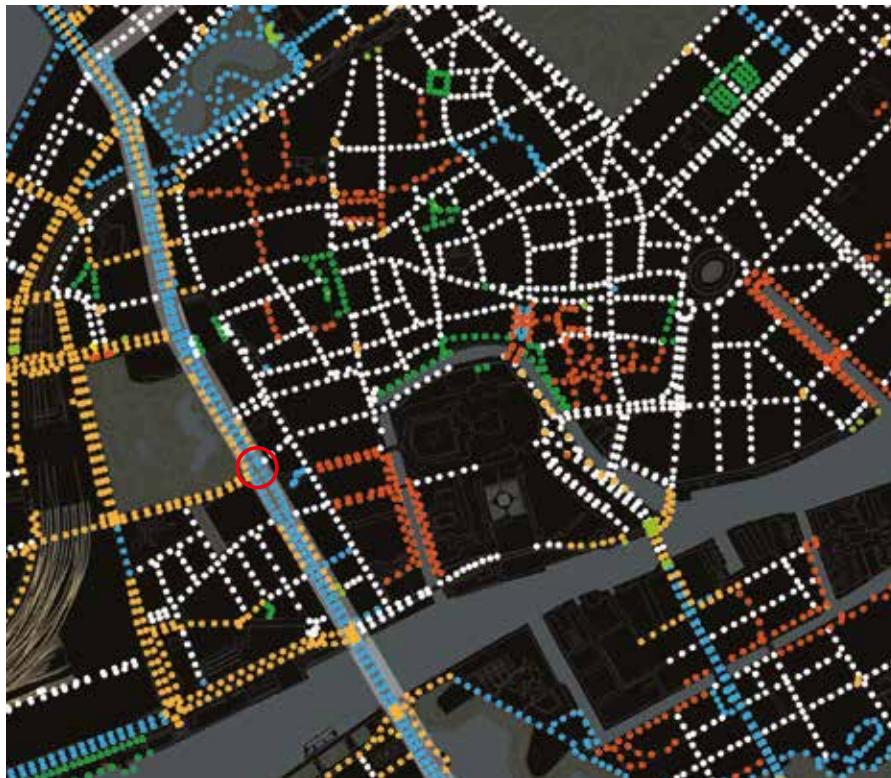


*„ der ligger et anlæg i mørke midt på H.C. Andersens Boulevard “*

*“a monument standing in the darkness in the middle of H.C. Andersens Boulevard ”*

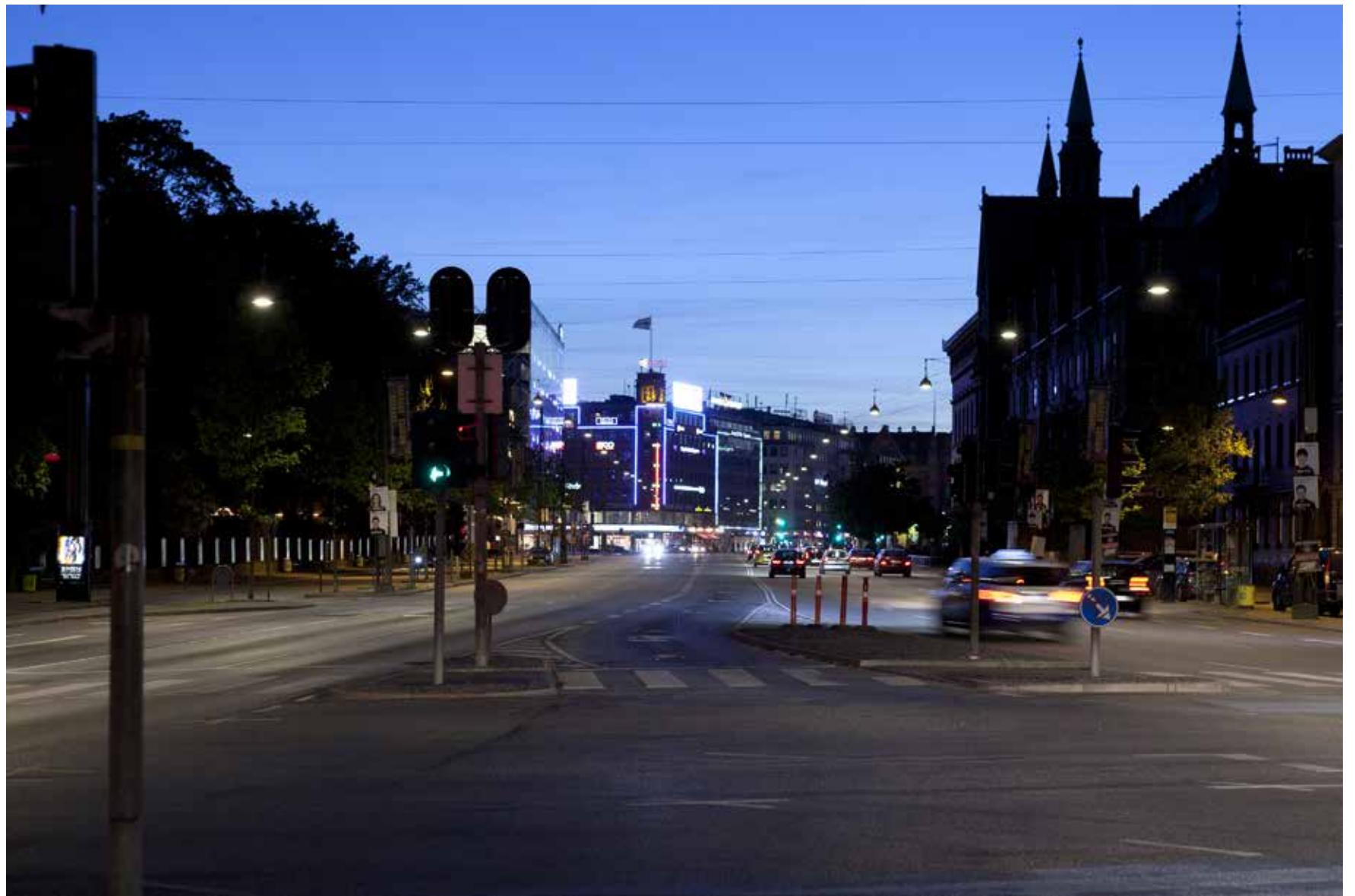
# H.C. Andersens Boulevard

Regionalvej / Regional Road



H.C. Andersens Boulevard / Stormgade / Tietgensgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no

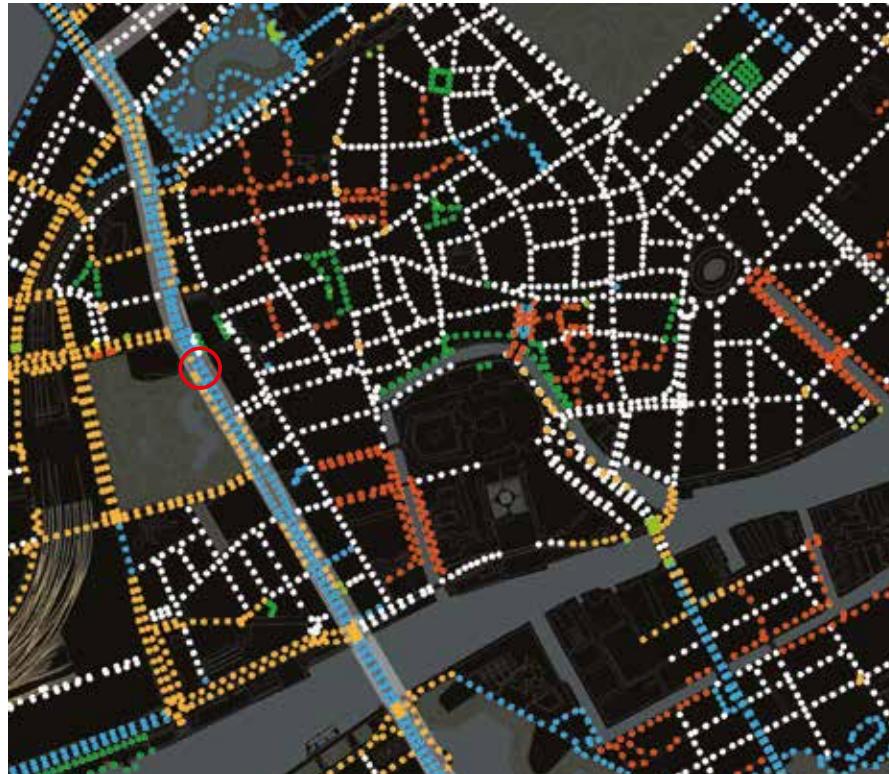


*„ her blander den optiske linjeføring af LED-gadebelysning sig med mørke bygningssiluetter og Rådhuspladsens lysende elementer “*

*“visual guidance from LED street lighting mixes with the dark silhouettes from the buildings and the luminous elements of Rådhuspladsen (Town Hall Square) ”*

# H.C. Andersens Boulevard

Regionalvej / Regional Road



H.C. Andersens Boulevard / DI

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no

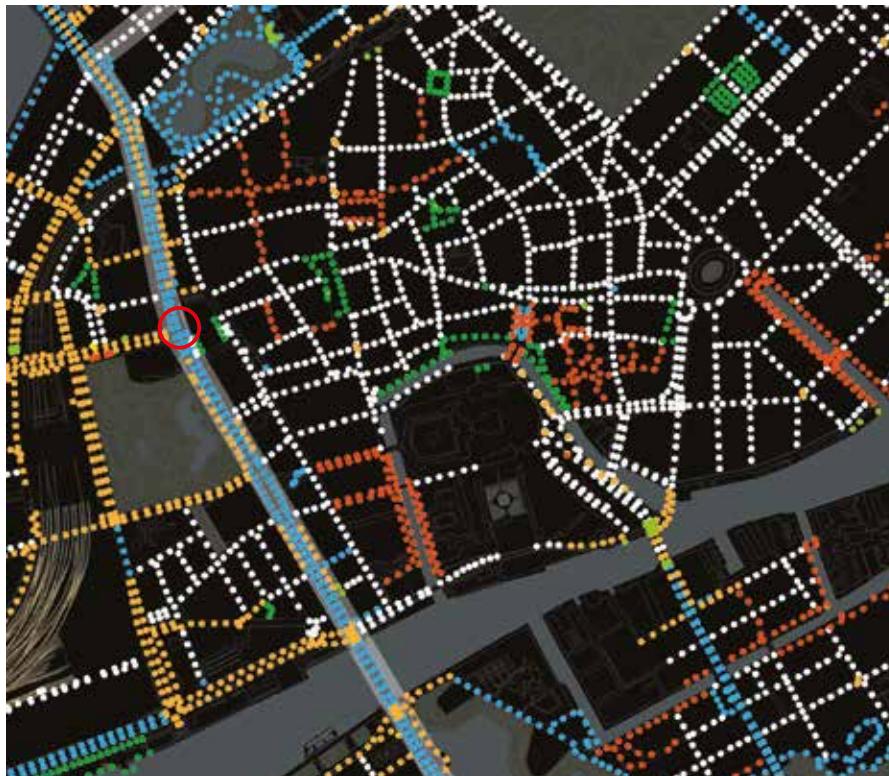


„efter Tivolis mørke og kulorte baggrund kommer 3 bygninger med hver sin generations lyskilder: glødepære, LED og neon“

“having passed the darkness and decorative lights along Tivoli, three buildings, each with their own distinct lighting, appear; using incandescents, LEDs and neon respectively, each representing a generation of light sources”

# H.C. Andersens Boulevard

Regionalvej / Regional Road



H.C. Andersens Boulevard / Vesterbrogade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



„DI-bygningens facade er LED-dynamik, mønstre og farver ved siden af ”Richshusets” termometer af neon – 2 bygninger med hver sin dynamiske styring“

“next to the outdoor neon thermometer of Richshuset, the facade of the DI building exudes LED dynamism in patterns and colours – two different expressions of lighting control”



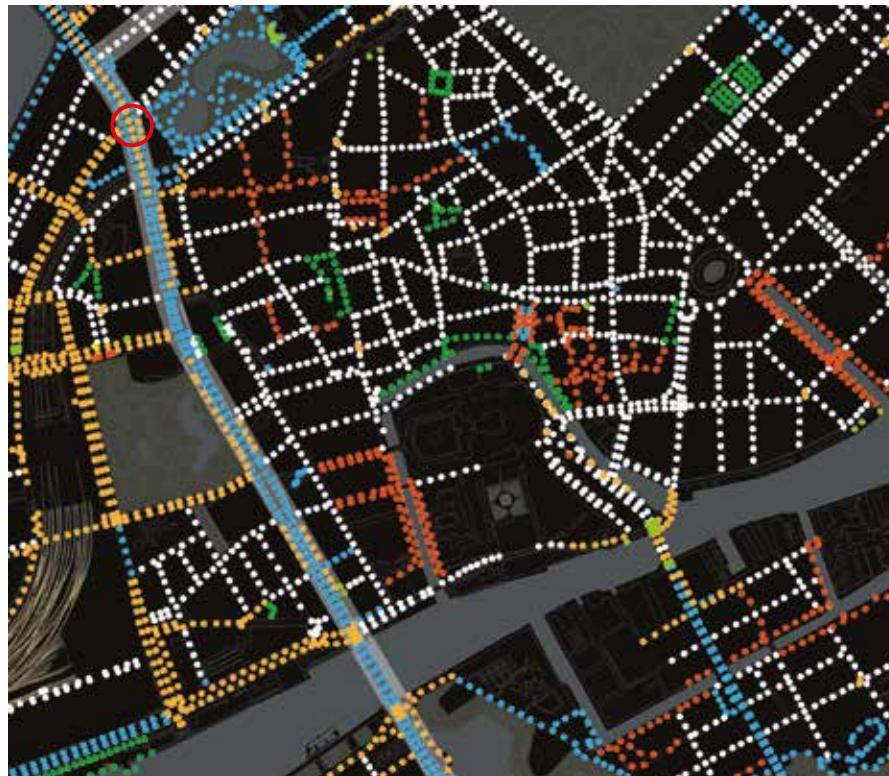


„på vej ud af Rådhuspladsens mange lyselementer, leder LED-gadebelysningens optiske linjeføring på vej“

“moving away from the many luminous elements on Rådhuspladsen, the visual guidance of the LED street lighting leads the way onwards”

# H.C. Andersens Boulevard

Regionalvej / Regional Road



H.C. Andersens Boulevard / Gyldenlovesgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes for 2016 replacement before 2016
 	● LED / ● Hna	3000 K / 2000 K	70-80 CRI / 25 CRI	2 / 2	nej / ja no / yes

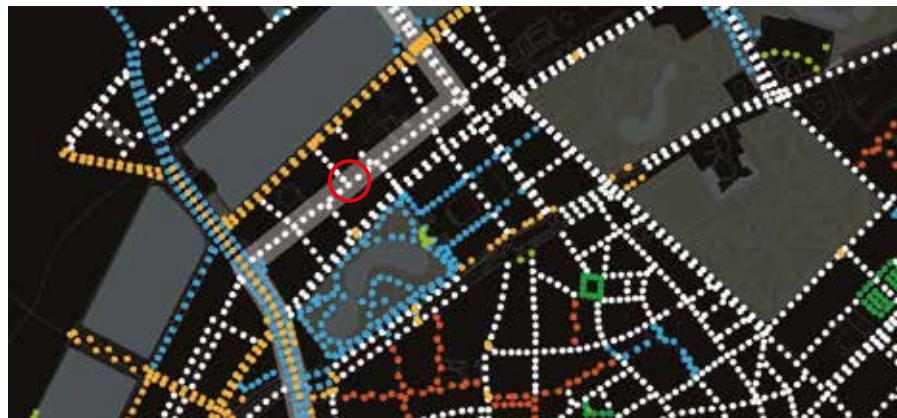


,, varm høytrykksnatrium markerer boulevardens midterrabat “

“high-pressure sodium light marks the verge in the middle of the boulevard ”

# Nansensgade

Lokalgade / Local Street



Nansensgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no



„ den smalle gade tillader lyset fra gadebelysningen at belyse facaderne, der også giver lys i form af varmt lys fra vinduerne “

“the narrow street allows the illumination from the street lighting to reach the facades, and warm light can be seen emanating from the windows ”

# Frederiksborrgade

Strøgade / Shopping Street



Frederiksborrgade / Nansensgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no



*„gadens træer medvirker til et levende lys- og skyggespil“*

*“the trees on the street create a lively play of light and shadow”*





„de to rækker gadelamper belyser husenes facader foruden, oppe over forretningsetagen ses lyset inde fra boligerne gennem vinduerne“

“the illumination from two rows of wire-hung street lamps reaches the bases of the facades, and above the street level shops light emanates from people's homes”

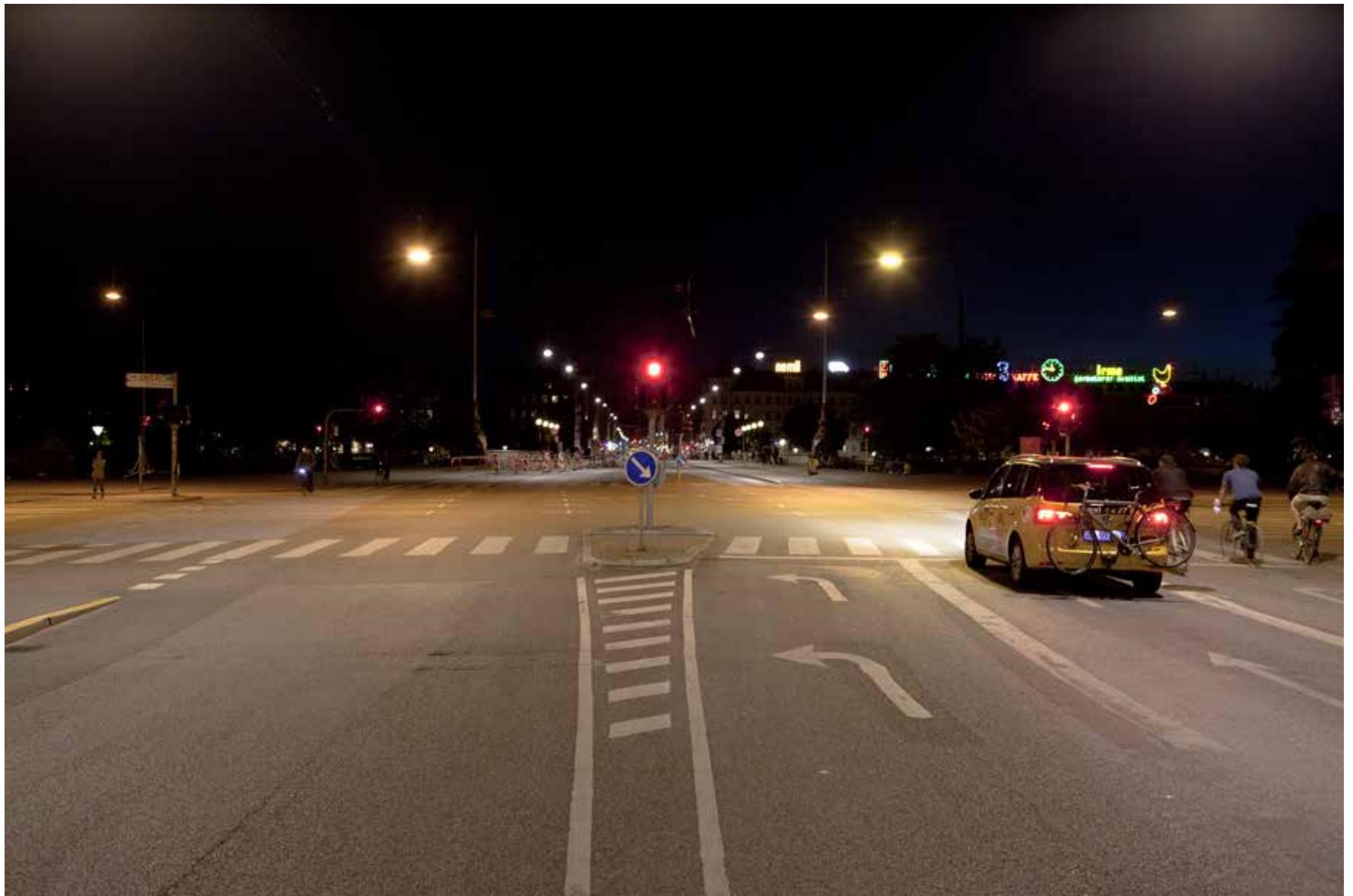
# Frederiksborrgade

Strøgsgade / Shopping Street



Frederiksborrgade / Søtorvet

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no

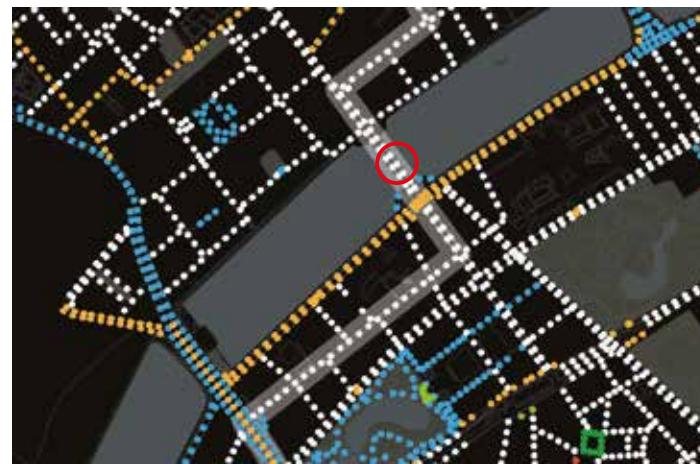


*„her 'skæres' stroggadens kølige metalhalogenbelysning 'over' af den regionale vejs varme højtryksnatrium“*

*“here the cool metal halide lighting of the shopping street is sliced through by the warm high-pressure sodium illumination of the regional street”*

# Dronning Louises Bro

Strøgade / Shopping Street



armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no



„gadelamperne med opal skærm skaber tydelig optisk linjeføring ned gennem Nørrebrogade“

“the street lamps outfitted with opal diffuser shades create clear visual guidance down Nørrebrogade”





*„broens armaturer skaber en helt særlig 'Dronning Louises Bro stemning' hvorfra der er kig til omgivelsernes fjerne lyselementer“*

*“the bridge luminaires create a special 'Dronning Louise Bro atmosphere', with a view to distant luminous elements in the surrounding area ”*

# Nørrebrogade

Strøggade / Shopping Street



Nørrebrogade / Ravnsborggade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no

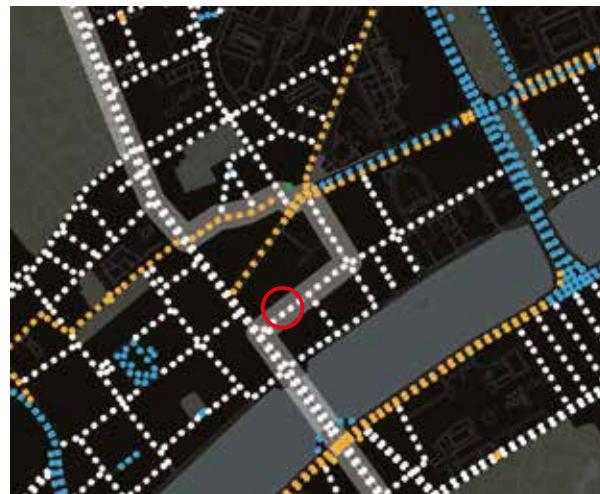


*„gadelampernes optiske linjeføring fortsætter gennem Nørrebrogades forskelligartede butiksfacader“*

*“the visual guidance of the street lamps remains a constant on Nørrebrogade as it runs past the many varied kinds of shop front lighting”*

# Ravnsborgsgade

Lokalgade / Local Street



armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	○ CDO	3000 K	88 CRI	1	nej no

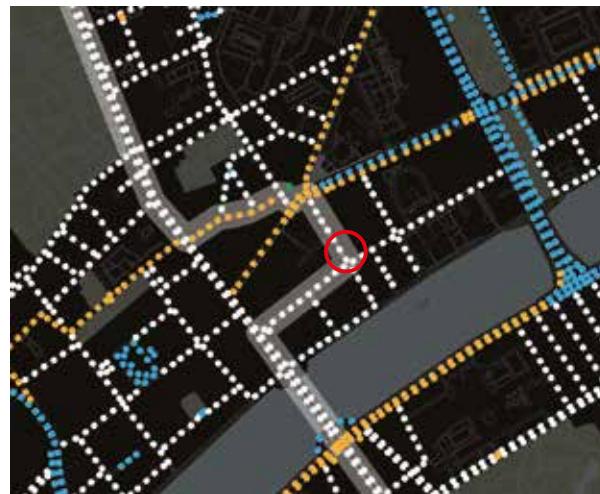


„her skaber gadens bredde, huse med forretninger og caſeſ foroven sammen med rækken af gadelamper en belyſning, der er typisk for den københavnske gade“

“in this street, a typical and characteristic Copenhagen street lighting is created via the wire-hung street lamps, the width of the street, the buildings with their shops and cafés at street level and housing above”

# Sankt Hans Gade

Lokalgade / Local Street



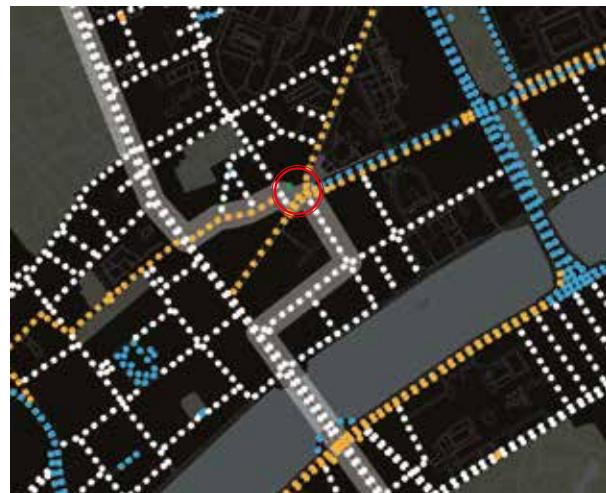
armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	○ CDO	3000 K	88 CRI	1	nej no



„ denne gade er så smal, at lyset fra gadelamperne når godt op af facaderne – den smukke og velbelyste facade ud til Sankt Hans Torv ses for enden af gaden “

“this street is so narrow that the illumination from the street lighting reaches well up to the facades – the beautiful and well-lit facade towards Sankt Hans Torv can be seen at the end of the street ”

## Sankt Hans Torv



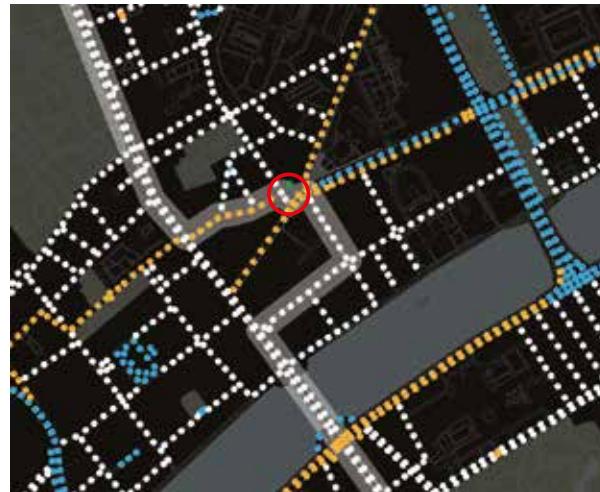


*„Elmegade lyser op på den anden side af Sankt Hans Torv delikate mørke-miljø og kulørte lyslementer“*

*“Elmegade lights up on the other side of Sankt Hans Torv’s pleasant dark environment coupled with decorative lights”*

# Guldbergsgade

Lokalgade / Local Street



Guldbergsgade / Sankt Hans Torv

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no



„gaderne omkring Sankt Hans Torv belyses af højtryksnatrium og metalhalogen, hvilket skaber en lavmalt visuel uro“

“the streets around Sankt Hans Torv are illuminated by high-pressure sodium and metal halide light sources, which create an atmosphere of subtle unsettledness”

# Elmegade

Lokalgade / Local Street



Elmegade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	1	ja yes



„varmt højtryksnatriumlys vidner om tidligere tiders tung trafik“

“warm high-pressure sodium illumination is proof of heavy traffic here in the past”

# Elmegade

Lokalgade / Local Street



Elmegade / Birkegade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	1	ja yes

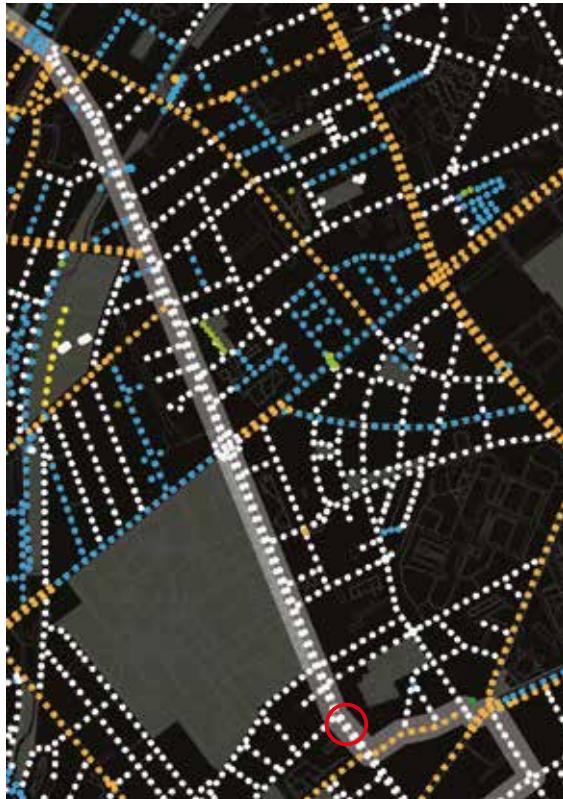


*„Birkegade, som belyses af metalhalogen, ser kolig ud ved siden af Elmegades varme højtryksnatrium“*

*“Birkegade, which is illuminated by metal halide light sources, looks very cool next to Elmegade that is bathed in warm high-pressure sodium light ”*

# Nørrebrogade

Strøggade / Shopping Street



Nørrebrogade / Griffenfeldsgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no

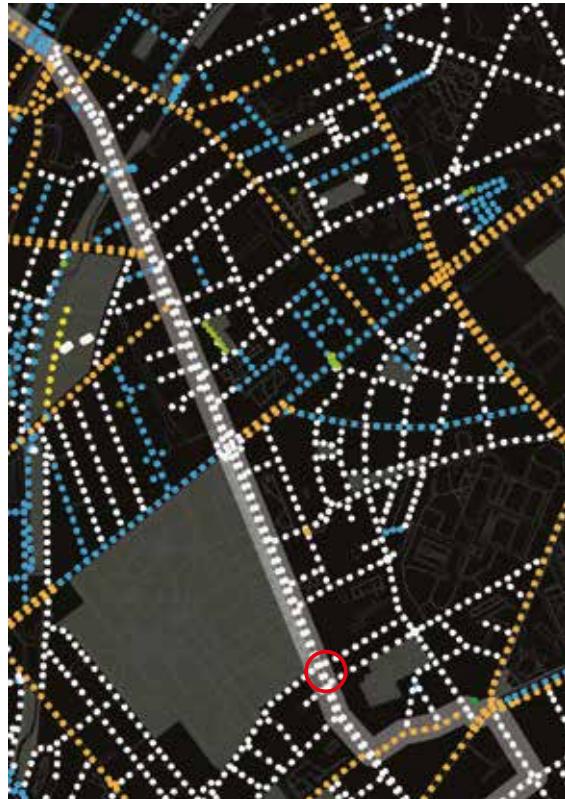


*„tilbage på Nørrebrogade fortsætter den karakteristiske række af to rækker opale gadelamper – det blå ur af neon ved Griffenfeldsgade er et velkendt pejlemærke“*

*“back on Nørrebrogade, the characteristic two rows of paralleling wire-hung street lamps continues – and the blue neon clock at Griffenfeldsgade that is a well-known local landmark can be seen”*

# Nørrebrogade

Strøggade / Shopping Street



Nørrebrogade / Nørrebro Rundel S

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no

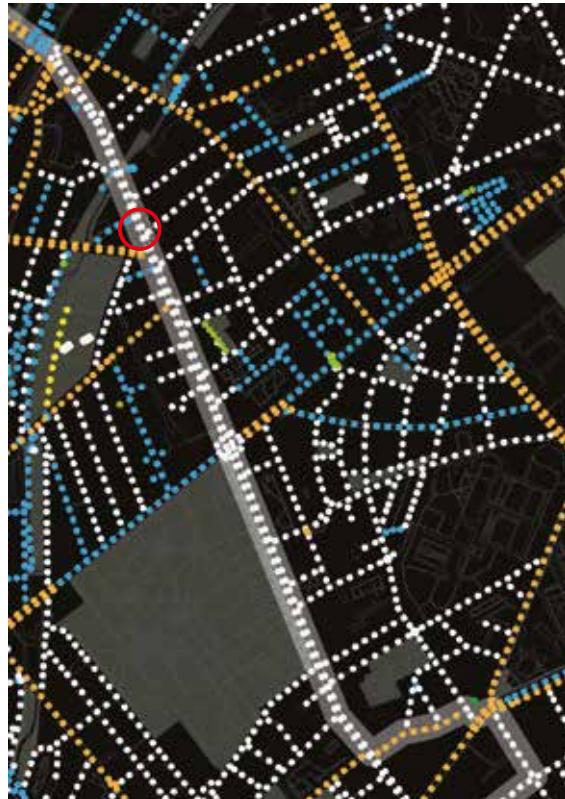


„det grønne og gule neon skilt „LÅSE“ overfor Assistentens Kirkegård er et andet velkendt pejlemerke langs den lange Nørrebrogade“

“the green and yellow neon sign stating the word LÅSE (lock) is mounted across from Assistentens Kirkegård (cemetery) and is another well-known landmark along the long stretch of Nørrebrogade”

# Nørrebrogade

Strøggade / Shopping Street



Nørrebrogade / Nørrebros Runddel N

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no

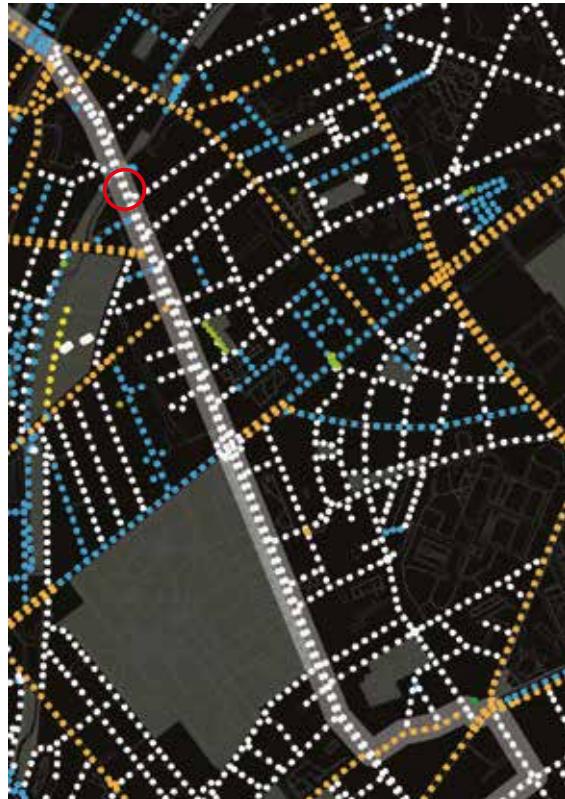


„et kig tilbage mod Nørrebro's Runddel og Nørrebrogades ensartede træk af to rækker opale gadelamper og forskelligartede butiksfacader“

“a view back towards Nørrebro's Runddel, where one can see the uniform feature of the two rows of wire-hung lamps set against the many different kinds of illumination emitting from of the various shop fronts ”

# Nørrebrogade

Strøggade / Shopping Street



Nørrebrogade / Den Røde Plads

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	2	nej no



*„om aftenen slukkes effektljuset ved Den Røde Plads – og den navnkundige „Superkilen“ henligger i mørke“*

*“late at night, the effect lighting of Superkilen is switched off, and thus the distinct features of Den Røde Plads (The Red Square) are enveloped in darkness ”*





„til gengæld markerer den lille shawarma og isbar sig på hjørnet af pladsen og i gaden ved hjælp af barens kulorte neon bogstaver“

“the little shawarma and ice cream bar at the corner of the square is easily recognisable by means of its sign glowing in blue and red neon”

# Frederikssundsvej

Fordelingsgade / Distributor Road



Frederikssundsvej / Frederiksborgvej / Vibevej

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	2	ja yes



„på Frederiksundsgade bliver gaden bredere og i den varme højtryksnatrium blander sig lys fra boligernes vinduer og forretningernes brug af forskellige lyskilder“

“at Frederiksundsgade the street widens and together with the warm high-pressure sodium street lighting different kinds of lighting from apartment windows and shops mixes”





*„ i det store kryds mellem Frederikssundvej, Frederiksborgvej og Vibevæj bliver bilernes lys også en vigtig hyskilde “*

*“ at the large intersection of Frederikssundsvej, Frederiksborgevej, and Vibevæj, car headlights also act as a significant source of illumination ”*

# Vibevej

Lokalgade / Local Street



Vibevej

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	LED	3000 K	70-80 CRI	1	nej no



*„ i denne boliggade er der en fin balance mellem gadebelysning og indgangsbelysning ud mod fortovet “*

*“on this residential street, there is a delicate balance between the street lighting and the lighting of the building entries, which reaches the pavement from the side ”*

# Ørnevej

Lokalgade / Local Street



Ørnevej / Vibevej

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no



*„Ørnevejs kulorte gavle er i komposition med den kontinuerlige række af gadelamper, takten af indgangsbelysning og de vilkårligt lysende vinduer“*

*“the colourful gables of Ørnevej create a composition together with the continuous row of street lights, the rhythm of light from the building entries, and the random light being emitted from the windows”*

# Ørnevej

Lokalgade / Local Street



Ørnevej / Hejrevej

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no



„det kulørte lys får facadernes struktur til at stå frem i mørket“

“the colourful light causes the facade's structure to stand forth in the darkness”

# Nordre Fasanvej

Fordelingsgade / Distributor Road



armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	1	ja yes

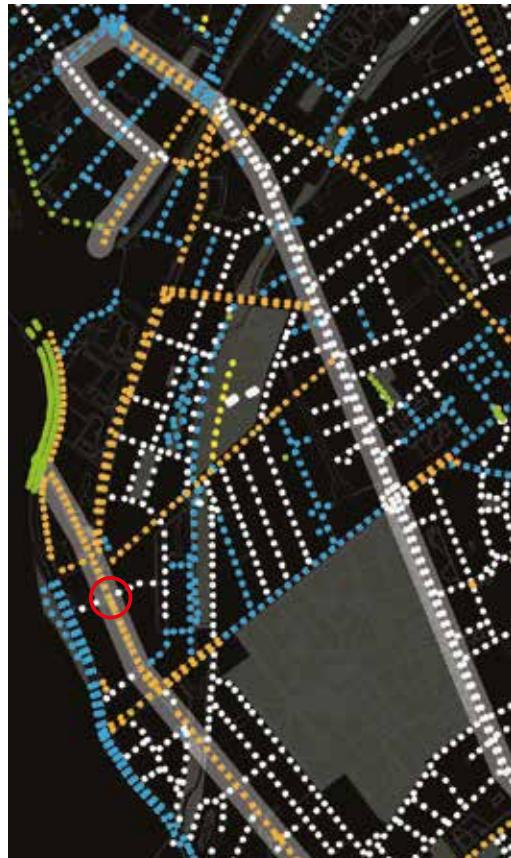


*„ den varme højtryksnatrium spredes via gadelampens reflektor ud i gaden og skaber en stilfærdig base for gadens øvrige lyskilder “*

*“by means of a reflector embedded in the street lamp, the warm high-pressure sodium illumination spreads onto the street and creates a calm base besides the other light sources in the street ”*

# Borups Allé

Bydelsgade / Districts Road



Borups Allé / Skotterupgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	1	ja yes

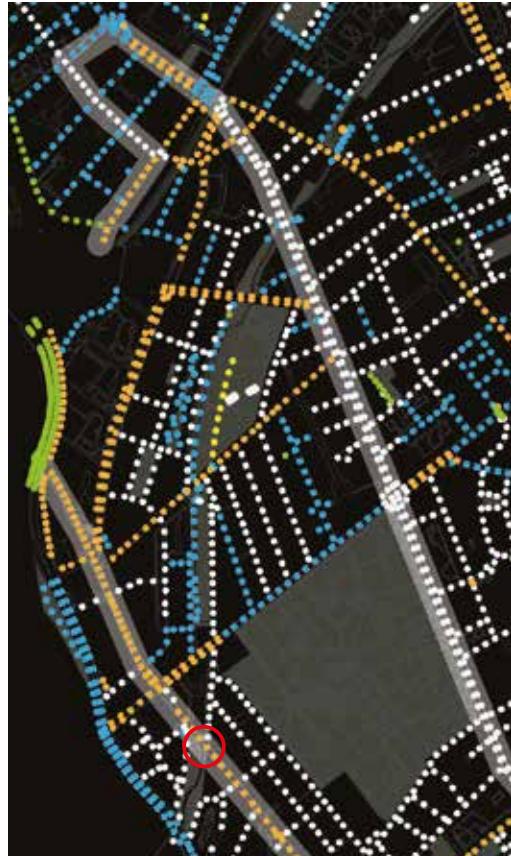


*„ lyset i træernes løv får gaden til at virke belyst “*

*“ light falling on the trees' foliage makes the street seem illuminated ”*

# Rantzausgade

Bydelsgade / Districts Road



Rantzausgade / Den Grønne Sti

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	1	ja yes



„ cyklisterne har fuld fart på ad Den Grønne Sti, som krydser Rantzausgade “

“the cyclists move at fast speeds along Den Grønne Sti (The Green Path), which crosses among other streets, Rantzausgade ”



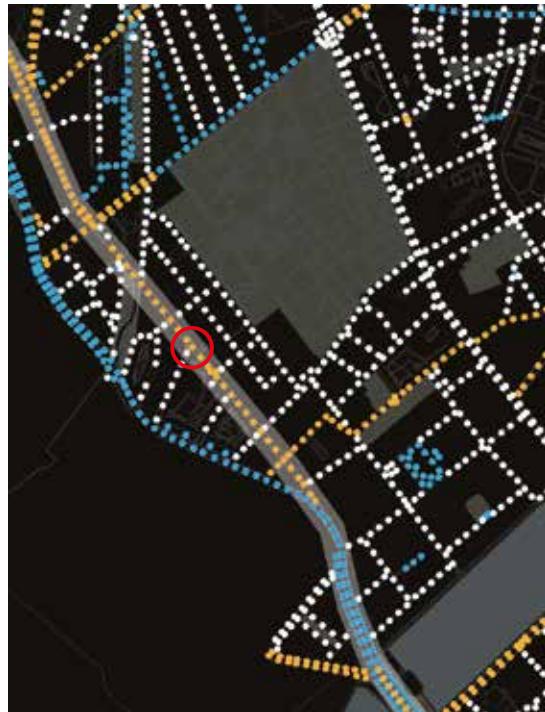


*„forskellige parklygter indikerer tilstedeværelsen af Den Grønne Sti, når den ses på afstand – stiens hurtige cyklister kommer alligevel som overraskelse“*

*“different types of park lamps indicate the existence of Den Grønne Sti seen at a distance, but nevertheless one is taken by surprise by the cyclists moving past at high speeds”*

# Rantzausgade

Bydelsgade / Districts Road



Rantzausgade / Brohusgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	1	ja yes



„ lyset fra Kobenhavnerlampen spredes blødt og gavmildt på vejbanen og op langs facaden “

“ illumination from the ‘Copenhagen Lamp’ disperses softly and generously onto the roadway and along the facade ”



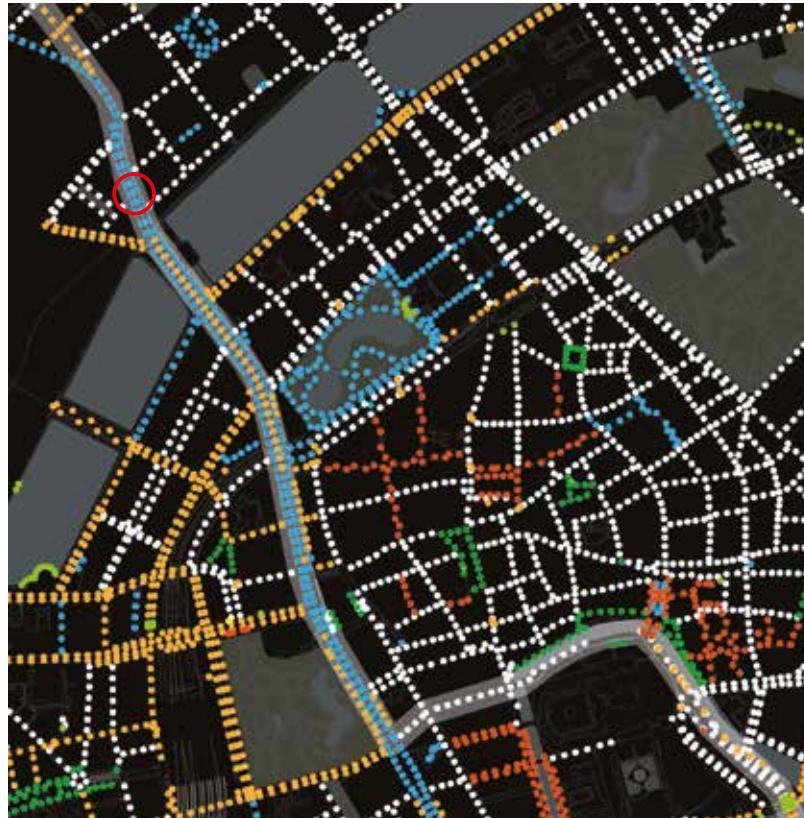


„ fodgangerovergangens gule blink træder ikke tydeligt frem i det varme lys fra gadebelysningens højtryksnatrium “

“the flashing crosswalk light is hardly visible under the warm glow of the street lighting created by high-pressure sodium ”

# Åboulevarden

Regionalvej / Regional Road



Åboulevarden

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*„armaturerne på bygningen langs Åboulevard giver varme og stemning til fortovet langs den trafikkerede boulevard“*

*“the luminaires on the building along Åboulevard provide warmth and ambience to the sidewalk that runs along the trafficked boulevard”*



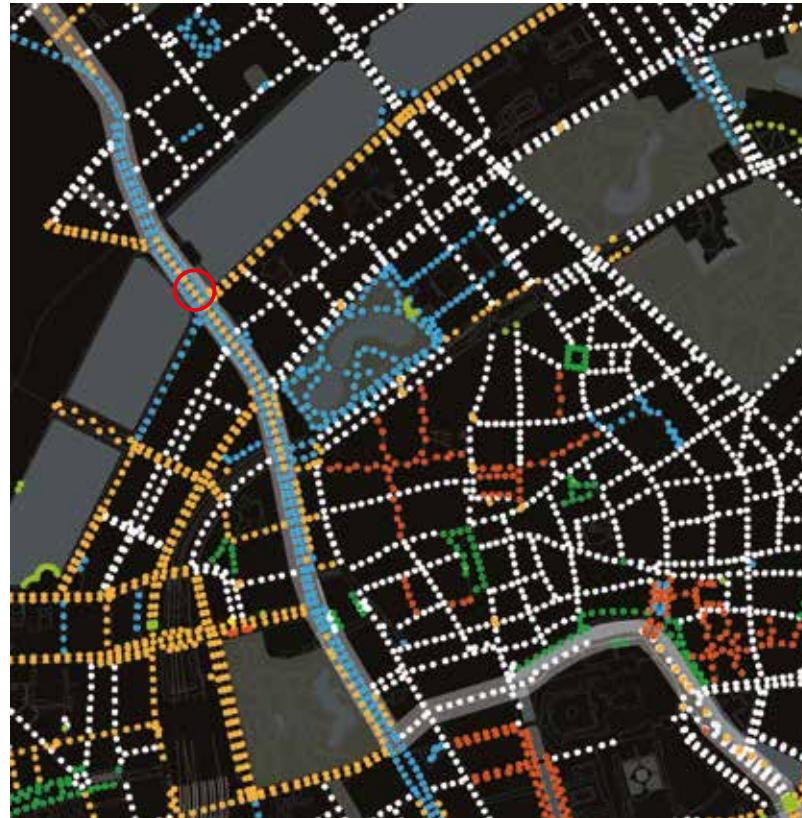


„ lyskæden af LED i kolige og varme toner gør cyklen i vinduet helt magisk “

“a chain of LEDs in cool and warm tones make the bike in the window appear quite magical ”

# Gyldenløvesgade

Regionalvej / Regional Road



Gyldenløvesgade / Nørre- og Vester Søgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes for 2016 replacement before 2016
 	● LED / ● Hna	3000 K / 2000 K	70-80 CRI / 25 CRI	2 / 1	nej / ja no / yes



„Søernes åbne landskabsrum giver kig til ”Irmahesten” og Nørre Sogades varme højtryksnatrium“

“the open landscape of Søerne (the lakes) affords a view to the ‘Irma chicken’ sign and the lakefront street’s warm high-pressure sodium illumination”



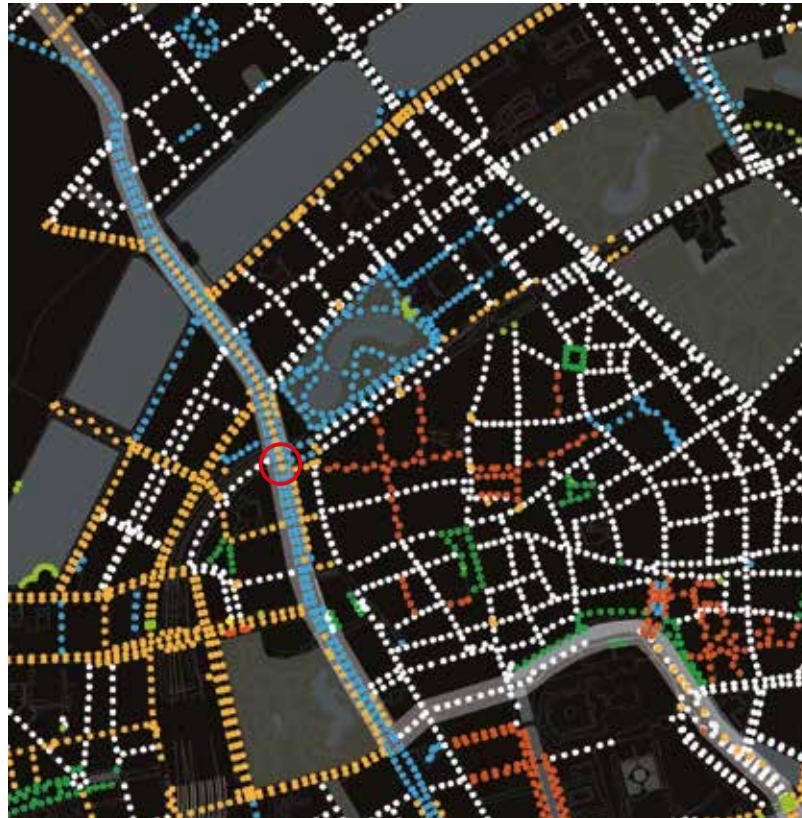


„dette store, brede kryds er et visuelt sammensurium af gadebelysning med forskellige lyskildetyper, lysignaler og et sæt kulørte LED-info skærme på Nykredits bygning“

“the large and wide crossing at the lakefront streets creates a hodgepodge of street lighting comprised of different kinds of light sources, traffic lights, as well as colourful LED information screens that are placed on the Nykredit building”

# H.C. Andersens Boulevard

Regionalvej / Regional Road



H.C. Andersens Boulevard / Hammerichsgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED / ● Hna	3000 K / 2000 K	70-80 CRI / 25 CRI	2 / 1	nej / ja no / yes



„boulevarden giver et sving forude, og de kulforte lysfarver på DI-bygningens LED-facade og Tivoliårnet leder på vej“

“the boulevard makes a turn further ahead and the vibrant LED facade of the DI building and the Tivoli Tower's ornamentation lead one on the way”

# H.C. Andersens Bouldevar

Regionalvej / Regional Road



H.C. Andersens Boulevard / Tietgensgade / Stormgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*,, de røde små lys på Tivolis udgang i kineserstil, tilfører eventyr til den LED-gadebelyste boulevard “*

*“the little red lights on the small Chinese pavilion of Tivoli add a fairy tale character to the boulevard and the cool LED street lighting ”*

# Stormgade

Fordelingsgade / Distributor Road



Stormgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO	3000 K	88 CRI	1	nej no



*„Tivoli's kulørt belyste tårne ses mellem Stormgades statelige, gadebelyste facader“*

*“Tivoli's illuminated towers are seen between Stormgade's stately, street lit facades”*

# Vindebrogade

Fordelingsgade / Distributor Road



Vindebrogade / Slotsholmen

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
mast post	○ CDO	3000 K	88 CRI	-	nej no

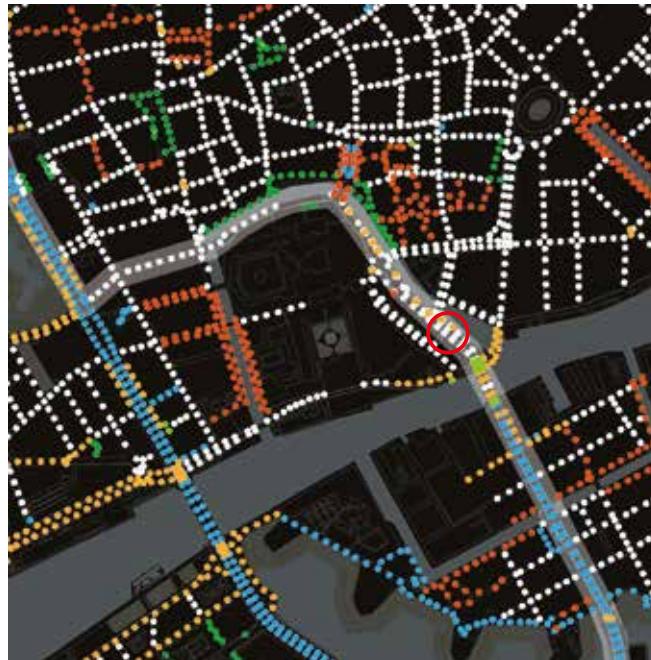


*„Slotsholmen ligger hen i mørke, bortset fra hvad gadebelysningen og lys gennem de markante bygningers vinduesåbninger giver af lys“*

*“Slotsholmen sits in darkness; aside from the illumination provided by the street lighting and the light visible through the windows of the characteristic buildings sited here”*

# Børsgade

Fordelingsgade / Distributor Road



Børsgade / Slotsholmen

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
mast pole	○ CDO	3000 K	88 CRI	-	nej no



„Holmen Kirke ligger hen i mørke, bag Holmens Kanal og Børygades gadebelysning“

“Holmen’s Kirke (church) sits far back, removed from the illumination of the street lights, and is only vaguely discernible behind Holmens Kanal (canal) ”





*„ Børsens facadebelysning slukker hen på aftenen, undtagen den kraftige belysning på indgangspartiet “*

*“ except for its powerful entry lighting, the lighting of the facade of Børsen (The Stock Exchange) facing Børsgade is switched off at night ”*

# Knippelsbro

Bydelsgade / Districts Road



Knippelsbro

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	<input type="radio"/> CDO / <input checked="" type="radio"/> Hna	3000 K / 2000 K	88 CRI / 25 CRI	2	nej / ja no / yes



*„kørebanen ligger badet i lys og midten af broen markeres af varmt højtryksnatrium“*

*“the roadway of Knippelsbro (bridge) is bathed in light from the street lighting, and the bridge's centre is marked by warm high-pressure sodium illumination”*

# Torvegade

Strøggade / Shopping Street



Torvegade / Wildersgade

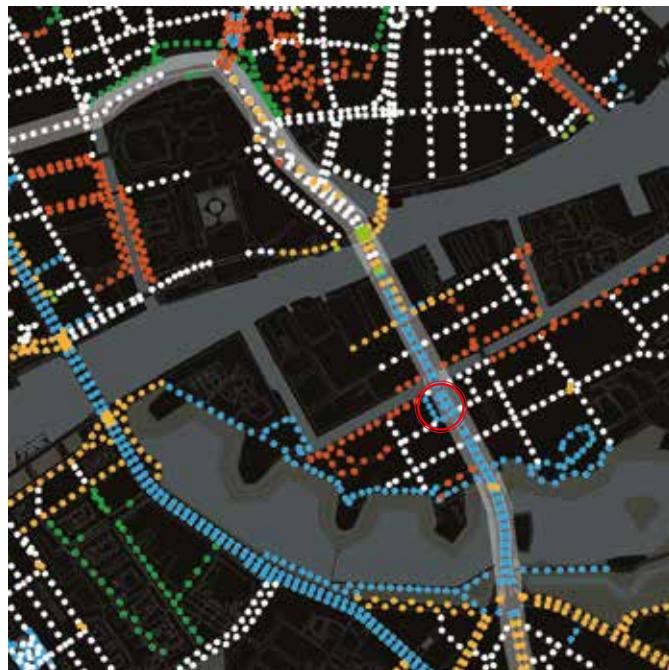
armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



„LED-gadebelysningen danner to optiske linjeforinger ind igennem Christianshavns karakteristiske bygninger“

“the two rows of wire-hung street lamps using LED create visual guidance through Torvegade and in between the characteristic buildings of Christianshavn”

## Christianshavns Torv





„ ved Christianshavns Torv er der en tredje lamperække, som belyser den del af torvet, der vender ud mod Torvegade “

“at Christianshavn (square), there is a third row of wire-hung street lamps, which illuminates the part of the square next to Torvegade ”





„der er ingen opbold på torvet om aftenen, hvor det er overladt til sig selv, affald og mørke“

“no one is hanging out on the square at night – it is left to itself, to trash and to darkness”





„ - så hellere sidde hvor der er lys „

“ so, rather sit where there is light ”

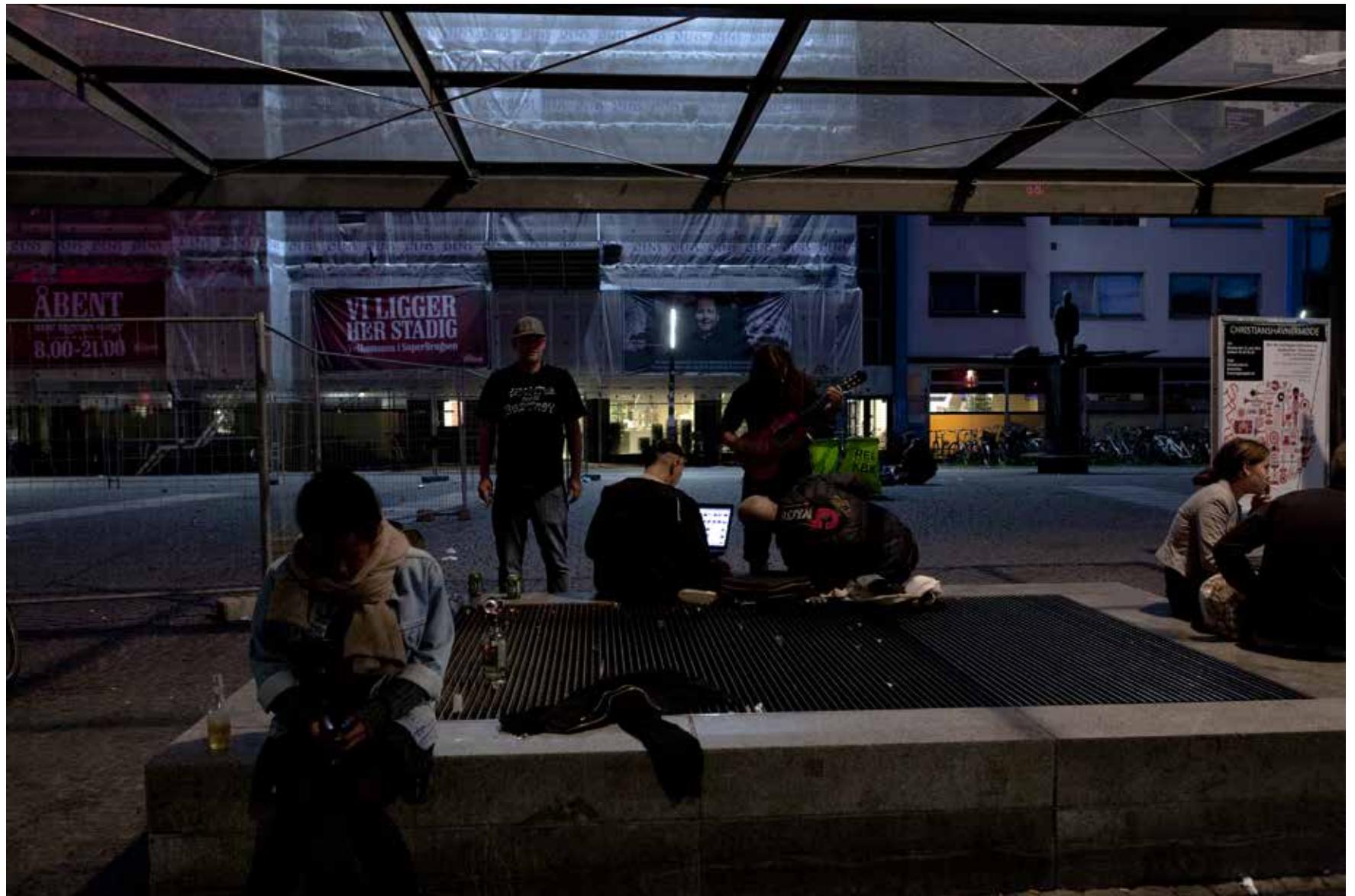




„LED-standerne belyser arealet foran de bygninger, der ligger ud til torvepladsen, og bortset fra bagud mod bygningerne, blander de ud i alle retninger“

“the LED posts illuminate the area in front of the building next to Christianshavns Torv, and they glare in all directions except for the area behind the poles themselves”

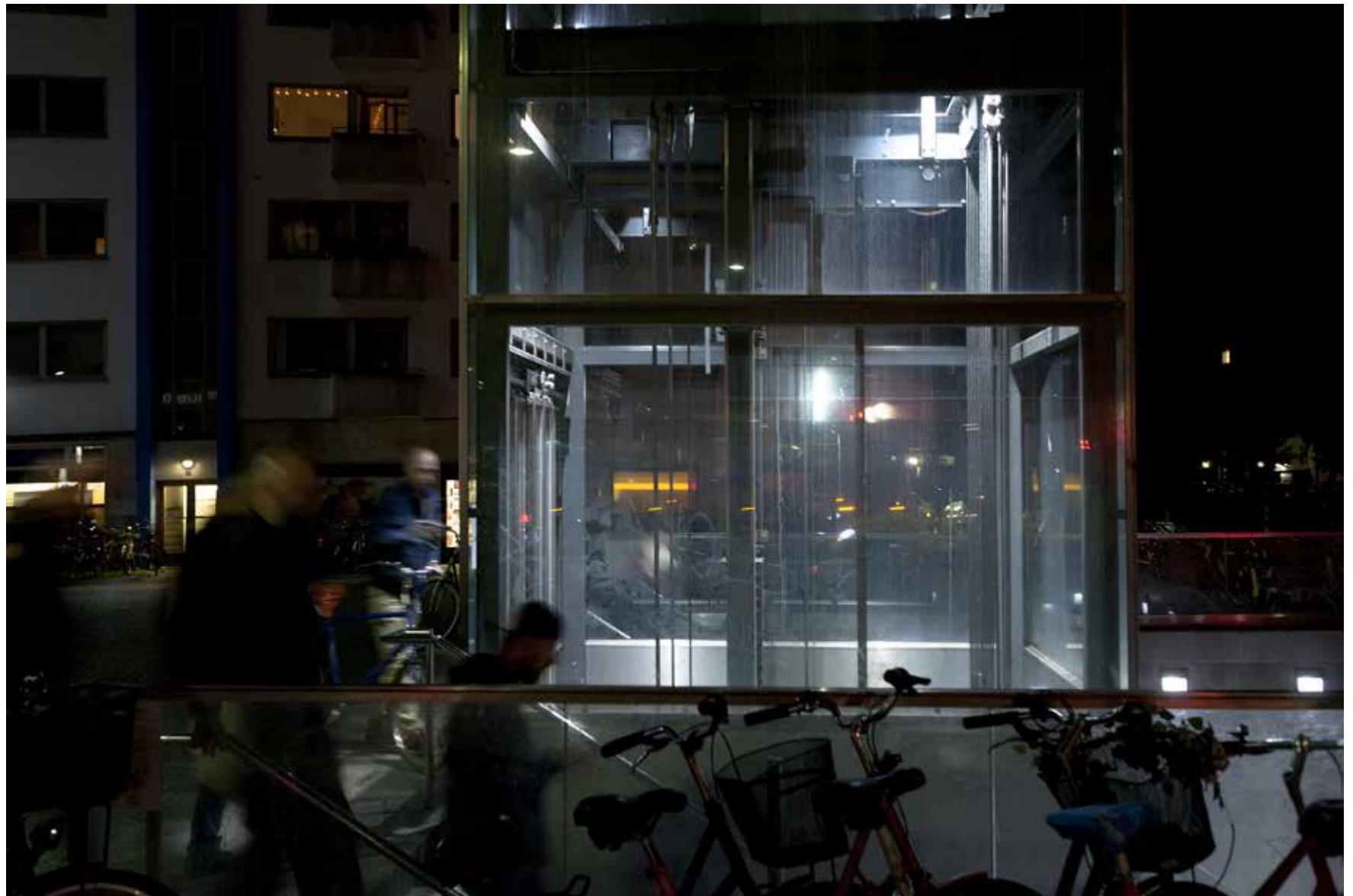




,, ved busstopstedet ses torvet i modlys “

“at the bus stop the square is seen against the light ”





*„på vej ned til metroen bades man i lys“*

*“one is bathed in light on the way down to the metro”*

# Torvegade

Strøggade / Shopping Street



Torvegade / Christianshavns Torv

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*„ den tredje lamperække giver samme slags lys til Christianshavns Torv, som Torvegades kørebane har “*

*“the third row of wire-hung street lamps illuminates the edge of Christianshavns Torv in the same manner as the roadway ”*

# Torvegade

Strøggade / Shopping Street



Torvegade / Dronningensgade

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*„ mellem Torvegades bygninger rammes fortovet af lys fra forretningsvinduer “*

*“ in between the buildings of Torvegade lighting from the shop windows reaches the sidewalk ”*

# Torvegade

Bydelsgade / Districts Road



Torvegade / Stadsgraven

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● LED	3000 K	70-80 CRI	2	nej no



*„ den wire-hængte gadebelysning indikerer Torvegades kurvede forløb igennem Stadsgraves grønne område “*

*“the wire-hung street lighting indicates the bend of Torvegade as it crosses through the green area of Stadsgraven ”*

## Christmas Møllers Plads



Christmas Møllers Plads



*„på vej mod Amagerbrogade skal man gennem højtryksnatriumlyset fra de høje maste på Christmas Møller Plads“*

*“towards Amagerbrogade, one passes the high-pressure sodium illumination of the large masts at Christmas Møller Plads”*

# Amagerbrogade

Strøgade / Shopping Street



Amagerbrogade / Christmas Møllers Plads

armatur lamp type	lyskilde light source	farvetemperatur colour temperature	farve gengivelse colour rendering	rækker wire rows	udskiftes før 2016 replacement before 2016
	● Hna	2000 K	25 CRI	2	ja yes



„tilbage på Amagerbrogade er der varmt højtryksnatriumlys fra to rækker gadelamper og stilfærdig optisk linjeføring fra Københavnlampen med reflektor“

“back on Amagerbrogade, there are two wire-hung rows of street lamps illuminating the street with reflected, warm high-pressure sodium, which creates a calm optical alignment down the street”



## Sammenfatning: At begribe gadebelysningens poesi

Den elektriske gadebelysning har længe haft stor betydning for navigation, oplevelse og sikkerhed. Den er en fuldstændig integreret og reguleret parameter for vores samfund, og har kun undergået gradvis forandring. I 2014 udtrykker gadebelysningsanlægget, at det befinner sig i en overgangsfase mellem tidligere anvendte lyskilder og LED. Gadebelysningsanlægget udtrykker en holden fast på det klassiske gadearmatur „Københavnerlampen“, mens nye opale variationer, som „Mini Opal Icon“, befinner sig særligt i strøg- og boliggader. Anlægget udtrykker en satsning på lyskilden metalhalogen, uden helt at være kommet af med højtryksnatrium, og så er der blevet installeret LED i armaturerne.

LEDs lave strømforbrug og lange levetid har gjort den til en lyskilde, der er i omfangsrig udvikling. Det er en lille lyskilde, der kan sættes sammen til en større lyskilde og det ses allerede nu, hvordan den i byrum optræder i alt fra billygter, medieskærme, lysskilte, div. kulørte og dynamiske gadgets til plads- og gadebelysning. Lyskilden kan ændre intensitet og farve ved elektrisk påvirkning og digitalt software, og anvendes den til belysning kan optiske systemer bruges til at rette lyset fra de små LED-enheder. Disse egenskaber giver LED nogle fortrin i forhold til traditionelle lyskilder med højere energiforbrug, hvor lysniveauet ikke kan reguleres og hvor lysfarve og farvegengivelsesevne er bestemt af lyskildens tekniske udførelse.

LED har i Københavns Kommunes belysningsanlæg anno 2014 været anvendt på en form for lige fod med de tidligere anvendte lyskilder, hvilket viser hvordan den er en lyskilde, der nok lader sig indpasse i eksisterende armaturer, men som opfører sig anderledes end de traditionelle lyskilder. Gadebelysnings traditionelle lyskilder er store og punktformede og lyser kraftigt fra dette punkt til en reflektor, der regulerer lysets spredning fra armaturet. LED-enhederne i Københavnerlampen belyser omgivelserne uden brug af reflektor – med stor energieff

## Summary: Grasping the poetry of street lighting

For a long time now, electric street lighting has been important for navigation, experience, and safety. It is a fully integrated and regulated parameter in almost all developed nations and communities. It has only gradually undergone change over time. Street lighting in the streets of Copenhagen, anno 2014, gives the impression of a lighting system in the process of a smooth transition between the times prior to LEDs and after. The point sources registered express a persistent use of the classic street lamp, the ‘Copenhagen Lamp’, whilst the newer opal street lamps, such as ‘Mini Opal Icon’, mixes in between and especially in shopping streets and local streets. The present point sources can be seen to represent a preference and aim towards using the metal halide light source, with LED luminaires being installed later – yet without being quite freed from the high pressure sodium light source.

LEDs’ low power consumption and long lifespan have positioned them as a light source in wide-ranging development. LEDs are a small sized light source that can be combined together into a larger light source. And already now one can see how LEDs in urban spaces perform in everything from car headlights, to media screens, to illuminated signs, to diverse colourful dynamic gadgets, and lighting for public squares and street lighting. The LED light source can change in intensity and colour via electrical exposure and digital software, and when LEDs are used for lighting then optical systems can be employed to direct and distribute the light from all the small LED light sources. These properties provide LEDs with some advantages over traditional street light sources that use more energy; where the lighting levels cannot be controlled and the light colour and colour reproduction capability are determined by the light source’s technical performance.

As of 2014, LEDs in the street lighting of the Municipality of Copenhagen have been utilised on a sort of equal footing with the previously

fektivitet til følge, mens LED-enhederne i „Mini Opal Icon“ ikke belyser omgivelserne direkte, men indirekte ved hjælp af den til LED specialdesignede reflektor. De traditionelle lyskilder belyser i modsætning til begge LED-løsninger både direkte og ved hjælp af reflektor.

Den videofilmede og fotograferede rute gennem Københavns gader viser, hvordan de wire-ophængte armaturer er et ensartet og genkendeligt element igennem byens forskellige typer gader. Armaturerne hænger i en eller to, og på brede boulevarder flere, rækker henover gaden, mens gadens bredde, husenes karakter, trafik og alle gadens andre lyskilder er forskellige alt efter hvilken gade man befinder sig i. Man kan sige, at gadebelysningen og de wire-ophængte armaturer skaber en stilfærdig grundstruktur i de lyse timer og en stilfærdig grundbelysning i de mørke timer, der lader gadens øvrige elementer ’komme til orde’ rent visuelt. ’Kludetæppet’ af gadebelysningsanlæggets forskellige typer armaturer og lyskilder skaber et lag af variation, som måske de færreste lægger mærke til. Variationerne består i belysningens forskellige farvetemperaturer, farvegengivelse af omgivelserne, hvordan lyset spredes og den optiske linjeføring, som rækken af gadelamper gennem gaden skaber. Den registrerede rute viser, hvordan disse variationer ikke desto mindre skaber en gadens grundlæggende belysningsfordeling og forudsætning for, hvordan gadens elementer optræder visuelt i forhold til hinanden.

Sideløbende med projektets mapping, har arbejdet med Københavns nye belysning været i fuld gang. LED kommer her til at spille en helt ny rolle, idet det bliver den mest udbredte lyskilde i anlægget og den vil blive implementeret i både nye og gamle typer armaturer. Det, at den er en lyskilde, der kan produceres med forskellige lysfarver, vil blive brugt til at markere byens forskellige vejkatagorier med forskellige toner hvid og det, at LED er konvertibelt til digitale styresystemer har ført til at arbejde

used light sources. This may be seen to indicate how LEDs are a light source that is adaptable to existing luminaires, yet that at the same time behave differently from traditional light sources. Street lighting's traditional light sources are large and singular (point-like), illuminating strongly from point to reflector which then regulates the dispersion of light emitted from the luminaire. The LED entities fitted into the traditional ‘Copenhagen Lamp’ illuminate the surroundings without the use of a reflector and with great energy efficiency, whilst the use of LEDs in the ‘Mini Opal Icon’ do not illuminate the environment directly, but rather indirectly by means of a custom designed LED reflector. In contrast to LED solutions, traditional light sources illuminate both directly and by means of reflector.

The video recorded and photographically registered cyclist route through the streets of Copenhagen shows how the wire-suspended luminaires are a consistent and recognisable elements throughout the city's various street typologies. The fixtures hang singularly or in pairs, and on wide boulevards they hang in multiples. They hang in the middle of the street, whilst the street's width, the buildings' characters, and all the various light sources are different depending upon which street is frequented. One can say that during the daylit hours the street lighting and the wire-suspended luminaires create quiet an unobtrusive base structure in the streetscape, and likewise during the hours of darkness they exude quiet an obtrusive illumination that lets the street elements visually ‘have their say’. Within the existing ‘patchwork’ of the present street lighting, different types of luminaires and light sources create a layer of variation that perhaps few people notice. These variations come from the various light temperatures, colour renderings, and light distributions, in addition to the character of the optical line that is created by the row of suspended luminaires. The registered cyclist route, nevertheless, elucidates how these

med nye dæmpningsklasser, så der kan spares energi ved natsænkning af gadebelysningen, samtidig med at vejkryds bibeholder et højere niveau pga. sikkerhedsforhold. Trinløs dæmpning og differentiering mellem de forskellige gadelampers niveauer har ikke tidligere været muligt.

Hvad kommer disse nye tiltag til at betyde for oplevelsen af byens gader i fremtiden? Svækkes den stilfærdige konstans mon, som gadebelysningsanlægget hidtil har udgjort, med det kommende anlægs nye armaturer og LED som den mest udbredte lyskilde? Hvilke oplevelsesmæssige kvaliteter vil den mere kategoriske planlægning af lysfarver og regulering af gadebelysningens niveauer gennem de mørke timer skabe? Hvordan vil de LED-belyste gader opleves i relation til byens øvrige rum?

Denne mapping er tænkt som et grundlag hvormed disse - og andre - spørgsmål kan behandles i den fremtidige diskussion og planlægning af byens gadebelysning. Mappingen gør det ved at anskueliggøre gadernes samlede lyskildebillede samtidig med, at den kommer helt ned i forløbet af gader og ser på, hvordan de ser ud som resultat af armaturtype, lyskildefarve, farvetemperatur i samspil med selve gaden og dens liv. Tanken er, at denne publikations opslag gennem cykelruten kan bruges som grundlag til at se på, hvordan gadebilledet forandres, når lyskilden og armaturet ændres – og til at se på, hvordan det samlede bybillede opleves på baggrund af turen gennem byens gader.

Udførelsen af dette projekts mapping slutter sig til introduktionen af indholdet i „Else/Where: Mapping – New Cartographies of Networks and Territories“; mapping er en proces, der kunne fortsætte i det uendelige, er ufuldstændig og i en ubestemt muterende form. Denne mapping får måske kun lige netop fat i den storslæde helhed, som det københavnske gadebelysningssystem opleves som - i en form den ikke altid har været i og ikke vedbliver at være i meget længere. Den udgør

variations contribute to the creation of a street's basic light distribution, as well as to the ways that a street's elements visually appears in relation to one another.

Concurrent to the research project's mapping, the Municipality's project for Copenhagen's new lighting has been in full swing. Here, LEDs come to play a new role, as they are the most widely used light source in the new installations and are being implemented; including both new and old types of luminaires. Because of the fact that LEDs are a light source that can be produced having different colours of light, they will be used to mark the city's different categories of roads in different white tones. And due to the fact that LEDs are convertible to digital control systems, they will be employed in connection with new classes of dimming so that energy can be saved using a 'night saving mode' for the street illumination whilst the junctions will retain a higher level of brightness for safety reasons. Continuous dimming and differentiation between the illumination levels of the different street lights has previously not been possible.

How will these initiatives affect experiences of the streets in the future? Is the unobtrusive constancy of the former street lighting weakened by the new street lighting and the initiatives done with LEDs? Which experiential qualities will be created by the more categorical planning of light colours and the regulation of the illumination levels of the street lighting during the hours of darkness? How will LED-illuminated streets be experienced in relation to the city's other urban spaces?

This mapping has been conceived as a ground upon which these questions – and others – can be addressed in the future discussions and planning of the city's street lighting. This mapping makes the overall picture of the present light sources clearer and comes right down into the actual physicality of the streets and examines how a street is experienced by

et forhåbentligt brugbart supplement til Københavns Kommunes nye belysningsmasterplan og til andre kommende mappinger af lyset i byens rum. Der er brug for mange indfaldsvinkler til at forstå, hvordan planlægning af belysning har indflydelse på oplevelsen af byens rum.

different types of users and how data such as luminaire type, light source type, colour temperature, etc. affects how each street segment appears. The idea is that each entry of the cyclist route can be used as bases for looking at the ways that the overall streetscape changes when a light source and luminaire change – as well as looking at how the overall townscape is seen and experienced based on the route(s) taken through the city's streets.

The execution of this project aligns with the Introduction of 'Else/Where: Mapping – New Cartographies of Networks and Territories', which states that mapping is a process that can continue indefinitely, is incomplete, and is of an undetermined mutating form. This mapping perhaps only just grasps the grand whole, since the Copenhagen street lighting system is perceived in a form in which it has not always existed and in which it will not remain in for much longer. This mapping hopefully represents a useful supplement to the new lighting masterplan of Copenhagen Municipality, whilst also supplementing other future mappings / research that investigates the lighting of urban spaces. There is a need for us to be wiser about the ways the present and future planning of lighting influences the experiences of urban spaces.

**Essay:**

## Tanker om den københavnske belysningskultur med LED

Katja Bülow, sommer 2014

„Jamen, det fungerer da skide godt – det lyser stadigvæk alt sammen!“ Min mapping-partner og jeg passerer Tivoli Hotel, som med sin kulørte LED facade og lysende LED skærme er eksempel på, hvordan ny teknologi før eller siden også kommer til København. Vi er ude på én af vores fotooptagelser af lyset i gaderne langs „cykelruten“. Min partner tager fotos og vi registrerer gaderummenes lyskilder og armaturer, for at definere den belysning, som skabes af lyset og omgivelserne i aftenmørket tilsammen. Øvelsen er en art fastholdelse af det forunderlige system af lyskilder, som belyser Københavns gader lige nu - i overgangen fra en række traditionelt anvendte lyskilder til engang i nær fremtid højst sandsynligt udelukkende at udgøre LED.

Vi folger nøje den rute, som jeg cyklede ad i min „derive“ gennem Københavns gader med et GoPro kamera monteret på hovedet. Min mapping-partner er så ikke lige sådan at holde på cykelruten. Han er fotograf af hjerteblod og projektleder indenfor belysningsbranchen i sit arbejde, så han er meget optaget af liv og mennesker i gaden samt alle de nye LED projekter, der ikke lige befinner sig på cykelruten... da vi kommer forbi Tivolis Hotel ved Kalvebod Brygge har vi (endnu engang) forladt ruten for liiige at se på den kommende cykelbro med LED belysning ved Fisketorvet, så da min registreringspartner udtrykker sin anderkendelse overfor dette eksempel på anvendelse af LED i byrummet sker der 2 ting:

Min uforbeholdne mening om den farvede belysning på bygningens facade ryger ud af munden på mig (jeg har det bare svært med en stor del af de LED-skærme, stærke niveauer og kulørte farveklatter, der skyder op med LED i disse tider) og så kan jeg ikke lade være at grine over vores to vidt forskellige syn på anvendelsen af LED i byrummet;

**Essay:**

## Thoughts on Copenhagen's Lighting Culture with LEDs

Katja Bülow, Summer 2014

“Well, it works damn well – they are still illuminating!” My mapping partner and I pass the Tivoli Hotel, which with its colourful LED facade and bright LED displays exists as an example of how new technology sooner or later comes to Copenhagen. We are out on one of our many registration fieldstudies, along the cyclist route. We take photographs and register the light in the street spaces in order to define the atmospheres that are created by the light – as a way of retaining the intricate ‘patch-work’ that the lighting creates in Copenhagen at this very moment. We are experiencing and registering the light in its transition from being a series of traditional light sources to being (most likely only) LED light sources sometime in the near future.

We carefully follow the route that was first created when I went on a *dérive* cycling through the streets of Copenhagen with the GoPro video camera mounted on my head. My mapping partner is not exactly one who keeps on track to the cyclist route. He is a photographer at heart and by profession he is a project manager in the lighting industry. He is very occupied with the urban life and people in the street, along with all the new LED projects that are not exactly located on the cyclist route. When we pass by the Tivoli Hotel at Kalvebod Brygge, we have (once again) gone astray from the cyclist route in order to have a quick look at the forthcoming cyclist bridge near Fisketorvet, which employs LED lighting. It is thus when my registration partner expresses his approval of the LEDs at Tivoli Hotel that two things occur:

Firstly, my candid opinion about the coloured lighting on the building’s facade and its illumination fly out of my mouth. (I merely have difficulty being sympathetic to most of the LED screens; to their strong light levels and to the colourful blobs seen frequently appearing with the use

min kritiske vurdering af LED som arkitektonisk tilpasset element i byrummet i forhold til min partners pragmatiske syn på LEDs ydeevne og holdbarhed.

En side af sagen er, at vores vidt forskellige syn kom så klart til udtryk i denne sene nattetime, en anden er, at disse syn repræsenterer helt grundlæggende temaer i forhold til anvendelsen af LED-teknologien i byens rum; arkitektonisk tilpasning af LED i forhold til omgivelserne og selve LED-systemets robusthed og holdbarhed. Samtidig gav belysningen af Tivoli Hotel anledning til refleksion over det at bedrive belysningskultur i København. Kan man sige at der findes en særlig lyskultur i København og hvordan træder LED ind i denne og ligefrem ændrer den?

København er kendt som en mørk by at være i, i vintermånederne. Mørket skyldes ikke kun beliggenheden på den nordlige del af jordkloden, men også at belysningen planlægningsmæssigt har været på kommunale hænder, og at man i mange år har prioritert den stigende biltrafik højt. Meget anden belysning end gade- og pladsbelysning har været på private hænder, og altså foregået gennem butikslysbelysning, lys fra private hjem, reclamer og enkelte arkitektonisk integrerede belysninger.

Denne 'puritanske' belysningskultur har skabt et helt særligt belysningsmiljø, hvor den nedtonede og velplanlagte gade- og pladsbelysning har givet plads til synlighed af de mange små private hændelser og initiativer. Udskældt af dem, der ønsker lys i København som i en 'rigtig' storby, og elsket af dem, der holder af lys som det optræder i mørkets særlige identitet.

Det er i dette nattelandskab, at LED lyskilderne er godt på vej til at holde deres indtog i – og som man vel kan kalde et resultat af den hidtidige belysningskultur.

of LEDs these days). Secondly, I cannot help but laugh out loud over our two very different viewpoints on the application of LEDs in urban spaces: my critical assessment of LEDs as architecturally adapted elements in urban settings, compared to my partner's more pragmatic view of LEDs performance and durability.

One side of the matter is that our different perspectives came to be so frankly expressed at this hour of the night. Another side is the fact that these views represent fundamental themes in relation to the use of LED technology in urban spaces at night; i.e. the architectural adaptation of LEDs in relation to their surroundings and the robustness and durability of the LED systems themselves. Simultaneously, the lighting of the Tivoli Hotel gave rise to an occasion for reflecting upon what it means to cultivate a 'lighting culture' in Copenhagen. Can one say that there is a specific lighting culture in Copenhagen, and if so, how then do LEDs enter into this and even alter it?

In terms of lighting levels, Copenhagen is known as a dark city to be in during the winter months. The darkness is not only due to the city's location on the northern part of the globe, but also to the facts that much lighting has been in municipal hands, and that for many years increasingly high motor traffic has been prioritised. Much lighting, aside from the lighting of the streets and public squares, has been in private hands, and has thus occurred as a combination of store lighting, light from private homes, advertisements, and in individual instances of architecturally integrated lighting. Considered by some as being 'puritanical', this lighting culture has created a particular lighting environment, where moderate and well-planned street and square lighting has made the many small privatised occasions and initiatives of lighting more visible via contrast. This situation is often criticized by those who want the night lighting in Copenhagen to be like that of a 'real city', but at the same time it is loved

Ser man på hvordan LED-lyskilderne er trådt ind i det københavnske bybillede, glider de ikke ligefrem i ét med omgivelserne. Stærkt lysende LED-skærme er på vej til at erstatte de spinkle, kulørte neonreklamer med massive lysende flader, en bred farvepalette og billedmættet grafik, Blågårds Plads er køligt belyst af specialdesignede LED-armaturer og Christianshavns Torv af en anden slags armaturer med LED, der til forskel fra de gamle armaturer retter lyset præcist foran sig, og lader det meste af pladsen og dens omgivelser i mørke. Lyskryds med LED lyser med langt større intensitet end tidligere og i lighed med facaden på Tivoli Hotel udnyttes LED til at skabe kulört belysning på bygninger, så den tiltrækker opmærksomhed.

Samlet set optræder LED mere kulört, mere køligt, mere intenst – og mere kommunikerende og interaktivt end den belysning, som vi har haft tidligere. I andre af verdens stærkt belyste storbyer gør disse lysende egenskaber nok ikke den store forskel, men netop i 'mørke' København bonner LED'en visuelt ud.

I Københavns Kommunes belysningsstrategi „Natten i byens lys“ fra 2007 er der blik for Københavns særlige mørke, samtidig med, at man ønsker at skærpe belysningen i forhold til byens arkitektur og rum, ikke blot som gade- og pladsbelysning, men som særlige indsatser i forhold til byliv, identitet, æstetik, funktion og teknik. Der ligger med denne strategi et ønske om at bevare 'de gamle dyder' - mørket – samtidig med at artikulere og understøtte byens særlige udformning og liv med belysning. Strategien lægger op til en tiltrængt renovering af den belysningskultur vi har haft hidtil, og der er da også allerede foretaget tiltag, der er på vej til at ændre på lyskulturen – både i form af byens nattebillede og den måde, som det bliver skabt på.

Det LED-belyste forløb gennem Ørnevej op til Frederiksbergbanen

by those who are fond of light that performs in concert with the special character of darkness. It is within this night landscape that LED light sources are well on their way to maintaining their foray – and which one could say is a result of the existing lighting culture.

If one looks at the ways that LED light sources have made their entry into Copenhagen's urban scene, they don't exactly blend visually into the surroundings. Very bright LED screens are on the way to replacing all the flimsy, colourful neon signs with massive luminous surfaces having a wide colour palette and image saturated graphics. Blågårdsplassen is coolly illuminated by specially designed LED luminaires, and Christianshavn Torv is illuminated by a different kind of LED luminaire that unlike the former luminaires distributes the light directly outwards and leaves most of the site and the surroundings in the dark. Traffic lights with LEDs illuminate with far greater intensity than their predecessors. And like the facade of the Tivoli Hotel, LEDs are exploited to create colourful lighting on buildings, attracting people's attention.

Seen overall, LEDs perform cooler, more colourfully, intensely, communicatively, and interactively than the lighting that we have had in Copenhagen in the past. In other brightly lit cities across the globe, these luminous properties may not make much difference, but it is precisely in 'dark' Copenhagen LEDs visually stand out.

In the Municipality of Copenhagen's lighting strategy, 'Night Under the City Lights' from 2007, there is an eye for Copenhagen's special darkness. And at the same time the strategy aims to strengthen the lighting in relation to the city's architecture and urban spaces; not only as street and square lighting, but also with particular efforts in relation to urban life, identity, concept and aesthetics, function, and technology. In this strategy there exists a desire to preserve the old virtues – including the darkness –

og DI-bygningens LED-facade ved Rådhuspladsen er gode eksempler på, hvordan man opnår strategiens målsætning med LED. De bidrager til byens arkitektur, rum og identitetsskabelse på hver deres måde. På Ørnevej er udvalgte facader på gamle industribygninger belyst med hver sin kulørte farve, hvilket skaber en nattens rytmefølelse ned gennem gaden og fokus på denne gades særlige type bygninger. Murene i viadukten under Frederiksbergbanen er belyst med grøn LED, og her bidrager de grønt belyste afskallede mure til en helt særlig stemning af tidens tand og murenes historie.

DI-bygningens LED-facade optræder blandt Rådhuspladsens lysende information på helt egne præmisser, og udnytter virkelig LEDens potentiale som kulört og dynamisk lyskilde. Et diagonalt mønster af LED skaber grundlaget for en hel verden af muligheder, der udforskes gennem den måde panelerne lyser på. Når det er mørkt manifesteres bygningskroppen visuelt af mønstrene, og det er altid spændende at se hvilket mønster, der er på færde, når man kommer forbi Rådhuspladsen.

Begge projekter ændrer på lylskulturen ved at gøre visse af byens steder mere kulørte og dynamiske, men det er i bedste planlægningstradition gjort i overensstemmelse med stedets særlige identitet og i samarbejde mellem parter, der har sikret arkitektonisk tilpasning af LED og holdbarhed både i form af anlæggernes fysiske robusthed og om de vedbliver at være gode eksempler. På Ørnevej har en landskabsarkitekt og en belysningsrådgiver lost opgaven for Københavns Kommune som led i et kvarterløftprojekt og DI-bygningens facade er udviklet i en dialog mellem kommunale parter, bygherre, leverandør, arkitekt og den innovative virksomhed „Kollision“. „Kollision“ har udviklet mediedesignet, grafikken og software samt en designmanual til facadens lysende mønstre, der sikrer at mønstrene forholder sig til facadens omgivelser i løbet af døgnet. Derudover udviklede de en 3D-model, som er et redskab, der

whilst also articulating and supporting the city's distinctive formation and vitality via lighting. The strategy sets the stage for a much needed renovation of the lighting culture we have had to-date in Copenhagen. And some actions have also already been taken, which are going to transform the lighting culture – both in terms of the city's night-time image and the ways in which it is created.

Both the LED-illuminated sequence running through Ørnevej up to Frederiksbergbanen and the DI building's LED facade at Rådhuspladsen (Town Hall Square) are good examples of how to achieve the strategy's objectives using LEDs. They both contribute significantly to the city's architecture, spaces, and identity creation in their own ways. On Ørnevej, facades of old industrial buildings illuminated with different vibrant colours were selected due to the ways they create a night rhythm down the street and emphasise this street's particular types of buildings. The walls under Frederiksbergbanen are illuminated using green LEDs, and here the peeling, green-lit walls contribute to a very special atmosphere that speaks to the ravages of time and walls' history.

The DI building's LED facade features amongst Rådhuspladsen's many illuminating informants on its own terms, and it truly utilises LEDs' potentials as a coloured and dynamic light source. A diagonal pattern of LEDs running across the building's skin provides the basis for a whole world of possibilities, which can be explored through the ways the panels light up. When it is dark, the body of the building is visually manifested via the patterns, and it is always interesting to see which pattern is in process whenever one passes Rådhuspladsen.

Both projects initiate change in the lighting culture by making some of the city's public spaces more colourful and dynamic. Yet this has been done in best planning tradition; in accordance with the site's specific

gør det muligt at vælge mellem forskellige mønstre og se dem i funktion inden, de vises frem på facaden ud mod Rådhuspladsen.

Disse projekter viser, at en fremtidig lyskultur med LED har brug for en visuel planlægning, der formår at koble partnerne i et projekt på en helt anden måde, end hvad vi har været vant til tidligere. Planlægningen skal gøre det muligt for offentlige og private parter at planlægge lyset i byens rum på tværs af faglige og rumlige grænser, både før og efter de nye systemer iværksættes. København er heldigt stillet, at have mørket og den delikate balance mellem offentlig og privat belysning som udgangspunkt for en ny lyskultur med LED, for det stiller nogle skrappe krav og værdifuld modstand til den kommende belysningsplanlægning.

Københavns nye belysningsmasterplan viser, at udvikling af en kommende lyskultur er i fuld gang og at tidens planlægning omkring gadebelysning er en helt anden end den, som den eksisterende gadebelysning indtil skrivende stund er et produkt af. Hvor det gamle belysningsanlæg blev planlagt, projekteret og drevet lokalt af Københavns Kommune, har tidens nye udbudsformer og krav til energibesparelse ført til en gadebelysning, der nu planlægges og drives af det franske firma „Citelum“. Dette firma leverer belysning til flere store byer, og har altså know-how og ekspertise med LED i storby-skala på globalt plan.

Har Citelums medarbejdere så forstået Københavns særlige lyskultur, eller planlægningskultur indenfor belysning af gader og pladser? – Har vi selv forstået den? Hvad har vi brug for at holde fast på og hvad har vi brug for at give slip på? Måske er lyskultur et ligeså vidtforgrenet fænomen, som selve lyset i byens rum. Det forandrer sig med tiden og opstår som resultat af tidens teknologi og den måde som det forvaltes på. Hvor Københavns lyskultur tidligere var et resultat af en veltilrettelagt gadebelysning i relation til alle de mere eller mindre regulerede

identity and in cooperation between the parties who ensured that the architectural adaptation of LEDs and durability in both the form of the physical robustness and in the fact that the examples continue to be beautiful and interesting. On Ørnevej a landscape architect and a lighting consultant resolved the task for the Municipality as part of an urban renewal project, and the DI building's facade was developed in a dialogue between municipal authorities, the client, the supplier, the architect and the design innovation company Kollision. Kollision developed the media design, the graphics and the software, including a design manual for the facade's luminous patterns, ensuring that the patterns relate to the facade's surroundings during the course of each day. Kollision also created a 3D model; a tool to see and choose amongst the patterns before they are animated across the facade facing Rådhuspladsen.

These projects show that a future lighting culture using LEDs also requires visual planning to be able to link partners in a project in a completely different way than what we have been accustomed to to-date. Such planning should enable public and private parties to plan the light in urban spaces across disciplinary and spatial borders – both before and after the new LED systems are implemented. Copenhagen is fortuitously positioned to have darkness and delicate relations between public and private lighting as a starting point for a new lighting culture utilising LEDs, because these conditions pose some tough requirements – as well as valuable resistance – to the planning of the lighting.

Copenhagen's new lighting master plan shows that the development of a future lighting culture is in full swing and that future planning around street lighting is highly other than the planning of the existing street lighting hitherto. Where the old street lighting was planned, designed, and managed locally by the Municipality of Copenhagen, the time's new tender forms and energy-saving requirements have led to an illumination

private initiativer, bliver den mere et spørgsmål om dialog og forhandling mellem mange forskellige enheder og systemer, som skal kunne fungere i forhold til hinanden. Som min anden projektpartner siger, bliver den konsekvens og ensartethed, der fulgte med de traditionelle lyskilder og deres egenskaber, nu et spørgsmål om at kunne håndtere LEDs optiske, kromatiske og dynamiske egenskaber - og dette samtidig med at tage stilling til oplevelsen af byens rum og de ting, som sker i dem.

of the streets that is planned and operated by the French firm Citelum. This company has developed street lighting for other large cities, and is seen to possess the know-how and expertise needed for using LEDs on a metropolitan scale globally.

And yet we must question: Have Citelum's employees understood Copenhagen's unique lighting culture, and the culture of planning with regards to the illumination of Copenhagen's streets and squares? Do we locals even understand the city's lighting culture and planning culture? As we move forward, what do we need to hold on to, and what ought we let go of? Perhaps lighting culture is as an equally all-embracing phenomenon as is the light in urban spaces itself. It changes over time and occurs as a result of the available technology of the day and the ways it is managed. Where Copenhagen's lighting culture was formerly the result of well-designed street lighting working in relation to all the more or less regulated private initiatives, in the future it might be a matter of many different parties and systems entering into dialogues and negotiations about the lighting of the city. As my other project partner states, the impact and uniformity inherent to traditional light sources and their properties has now transformed into a question of being able to handle the optical, chromatic, and dynamic properties of LEDs, whilst simultaneously considering the usability and experience of urban spaces and what is going on in them.





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