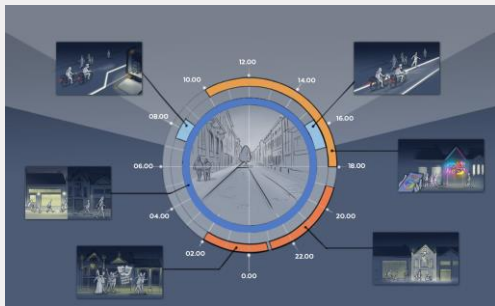


The value of smart lighting

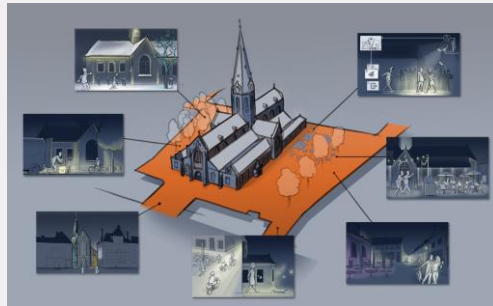
interaction levels for smart lighting to improve the use of public space

Rianne Valkenburg, TU/e LightHouse

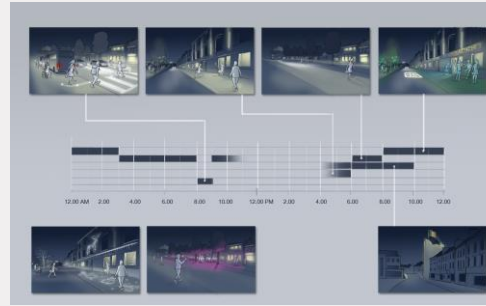
8 use cases in the cities of the Smart Space project



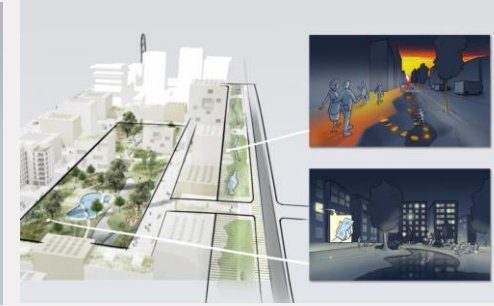
Atmosphere and light experience in shopping street the Stationsstraat in Sint-Niklaas



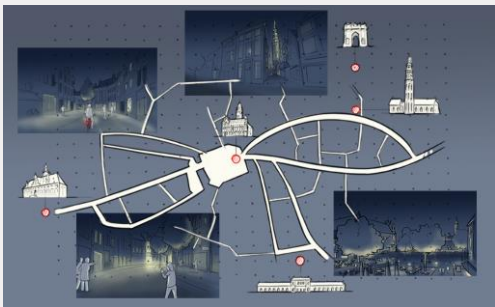
Perceived safety at the night life area Sint-Nicolaasplein in Sint-Niklaas



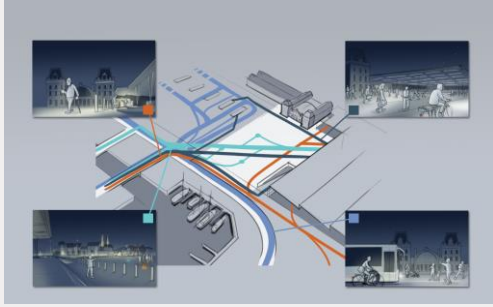
Supporting event experiences on Liberty Square in Tipperary



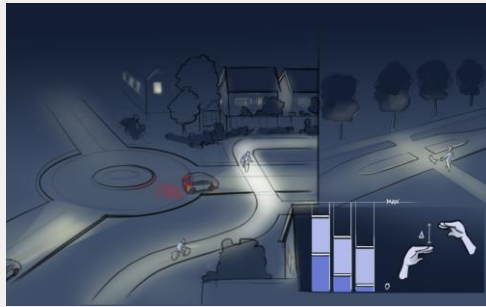
Lively urban space evoking (social) activities at Victoriaalaa and the connection with Central park at Sea in Oostend



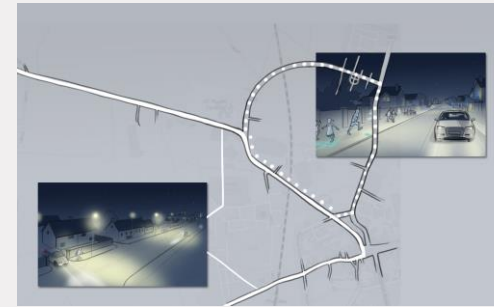
Atmosphere and light experience in shopping street Lange Delft in Middelburg



Atmosphere and light experience in the station square Oostende



Safe cycling and walking crossings on through roads at the Rooseveltlaan Middelburg



Safe cycling and walking along mixed traffic roads in Thurles

33 desired scenarios are designed as a basis for the smart lighting system in these places



33 desired scenarios are designed as a basis for the smart lighting system in these places

- 3 clusters of anticipated use
- Different levels of interactive use

A: Improving safety for all road users

B: Enhancing leisure experiences

C: Increasing security for nightlife

Static Lighting



Commuting safely: Providing a good overview of the area to support the flows of commuters (pedestrians, cyclists, bus and tram-passengers) to/from the train station and avoid collision.



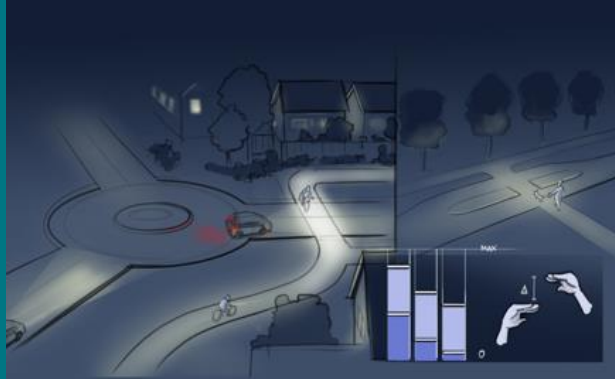
Enhanced shopping experience: Creating a warm atmosphere to attract more people in the afternoon and to emphasise the lighting of the shops and facades.

1

Static

- one lighting scene
- activated on/off via a clock timer in the control software
- no data is integrated in the system
- no communication (local switching)

Active Lighting



Crossing safely: Providing good visibility of cyclists and pedestrians crossing the road with multiple lighting scenes that dim further over the course of the evening and night, with constant contrast for a crossing, a bicycle/footpath and the main road.



Enhanced night life experience: Creating a surprising experience to make going out a memorable event, and tempt visitors to return. With a well-timed scene that lights-up objects in the street and creates a 'drawn-in/waving goodbye' experience for people going out.

2 Active

- multiple static lighting scenes
- activated on/off via a clock timer in the control software
- no data is integrated in the system
- no communication or one-way communication to light sources (individual or in groups)

Reactive Lighting



(Un)Loading and commuting safely: Creating good visibility to avoid accidents between loading and unloading delivery vans and commuting cyclists and pedestrians, with a brighter area around parked vans.



Enhanced nightlife experience: Creating a pleasant atmosphere during pub hours to make the area lively and enhance the safety of pedestrians, e.g. while being picked up or grabbing a cab.

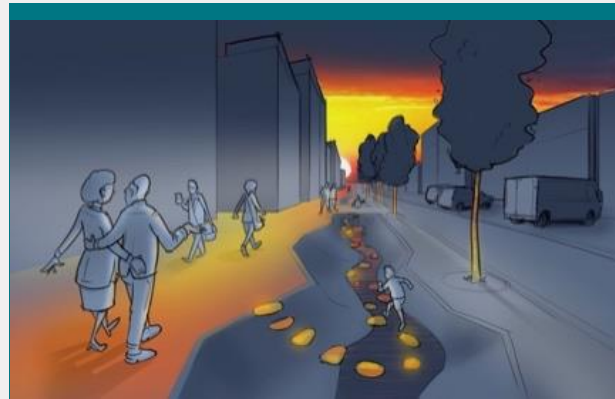
3 Reactive

- multiple static lighting scenes
- scene selection is activated by a single trigger or sensor (real-time – ‘slow’)
- monitoring data from the single sensor and the active scene
- bi-directional communication within a (local) system

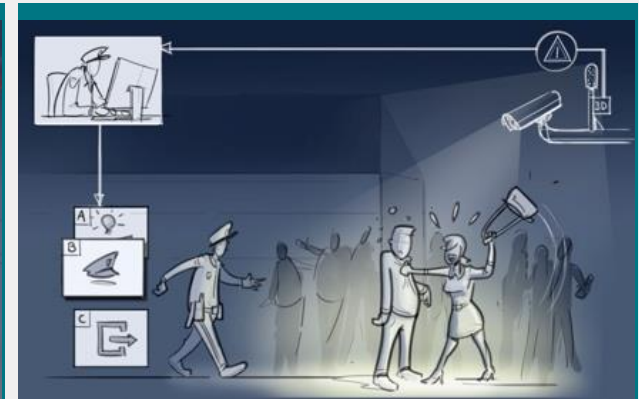
Interactive Lighting



Providing good visibility of cyclists and pedestrians alongside mixed traffic road with local adaption of the lighting to create brighter areas around pedestrians and cyclists



Creating a fun and lively area that evokes people to be active to walk and play together with specially-designed playful elements that interact with people, their movements and the environment.



Supporting guards in their jobs with technology to detect and locate incidents and de-escalate aggressive behaviour.

4 Interactive

- dynamic scenes with localised effect
- scene selection is activated by multiple triggers or use actions
- monitoring data from the sensors and the active scene
- bi-directional communication within a (local) system

Intelligent Lighting

Learning system to maximise activities outdoor and **increase safety and comfort of road users**, learning from historical data (e.g. use patterns and -near- accidents) to adapt settings and anticipating on real time input.

Enhance leisure experiences with personalised shopping routes or training (e.g. interval training and high score 'show') by connecting online user profiles and personal data to select scenes and learning from results.

Learning and adapt the scenes to atmosphere and emotion to avoid incidents for **increased security for nightlife**.

5

Intelligent

- self-creating lighting scenes with personalised effect
- decisions based on learning
- historical data for improvement system
- bi-directional high-speed communication

Interaction levels in Smart Lighting

5 Intelligent

- Personalised effect
- Decisions based on learning
- Historical data for improvement system

4 Interactive

- Dynamic scenes with localised effect
- Multiple triggers or use actions
- Monitoring data

3 Reactive

- Multiple static scenes
- Single trigger or sensing
- Logging data

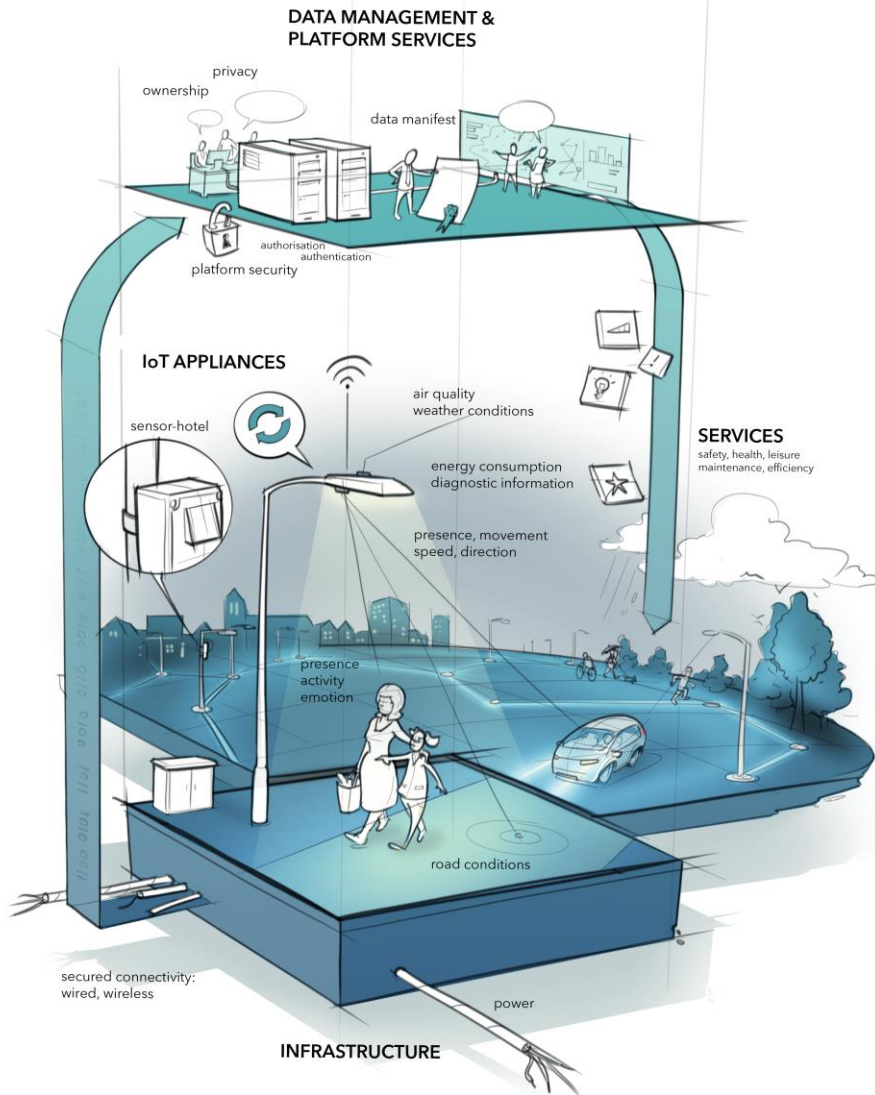
2 Active

- Multiple static scenes
- Switch by calendar
- No data

1 Static

- One scene
- On/off by clock
- No data

Smart public lighting



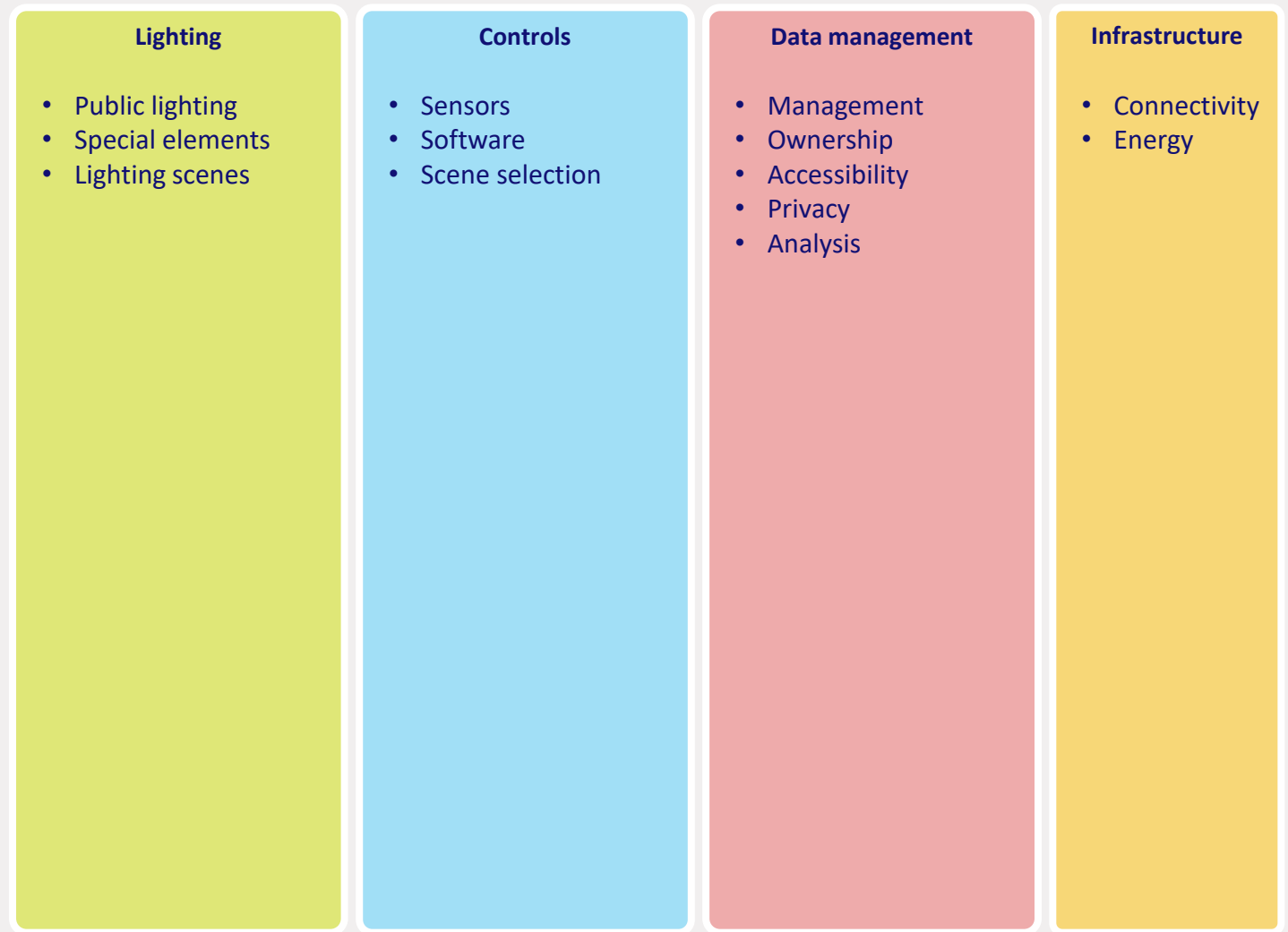
Data management

Controls
(sensors & software)

Lighting
(public lighting including
special elements)

Infrastructure
(energy & connectivity)

Smart Lighting System components



Interaction levels and requirements for Smart Lighting System

Note: higher levels also need the functionality of the lower levels

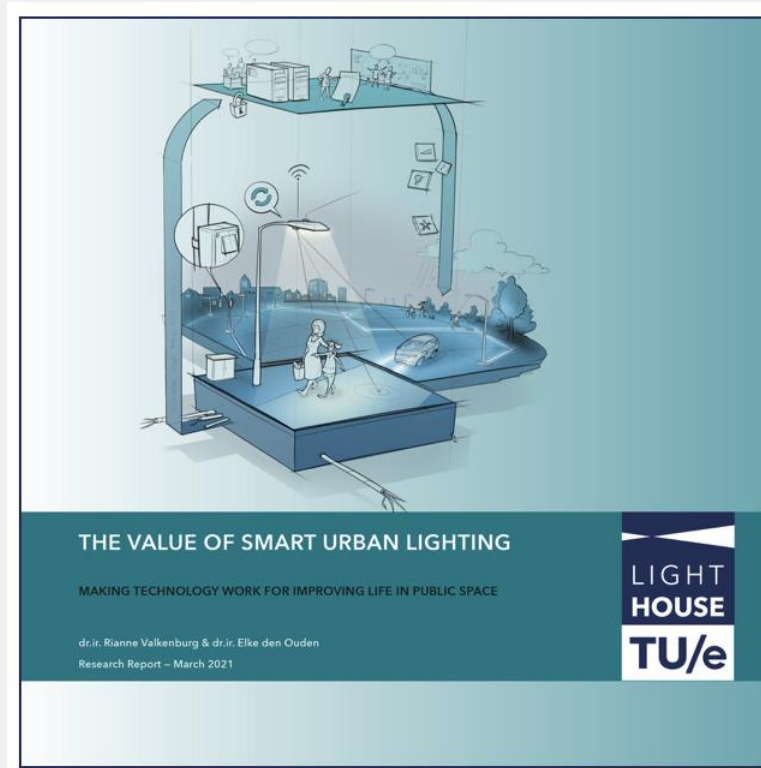
Interaction level		Lighting	Controls	Data management	Infrastructure
5	Intelligent	Dynamic scenes with localised effects	Scene selection and local dynamics by multiple triggers or user actions and personal profiles, adapting settings based on learning	Continuous data collection for learning and improvement of system performance and increasing impact	Bi-directional high speed communication within system and to the cloud
4	Interactive		Scene selection and local dynamics within scene activated by multiple triggers or user actions (real-time – 'fast')	Monitoring data from multiple sensors to create the right interaction (dynamics within the scene) and scene selection	Bi-directional high speed communication within (local) system
3	Reactive	Multiple static scenes	Scene selection activated by single trigger or sensor (real-time – 'slow')	Monitoring data from single sensor and active scene	Bi-directional communication within (local) system
2	Active		Switching of scenes based on schedule (time and/or calendar) in control software	Regular data collection (not integrated in the system) on patterns of use and emitted light by other sources as input for the design of the lighting scene	No communication (local switching) or one-way communication to light sources (individual or in groups) for switching
1	Static	One static scene	On/off via clock-timer in control software		

Opportunities for improving public space with smart lighting

- Lighting systems will become smarter in the (near) future
- Understand what this will mean for (your) public spaces
- 5 levels of interactive use with smart lighting define different lighting solutions
- Make future-proof decisions for investments in (smart) lighting systems

The value of smart urban lighting

Making technology work for improving life in public space



Free download: <https://www.tue-lighthouse.nl/SmartSpace.html>