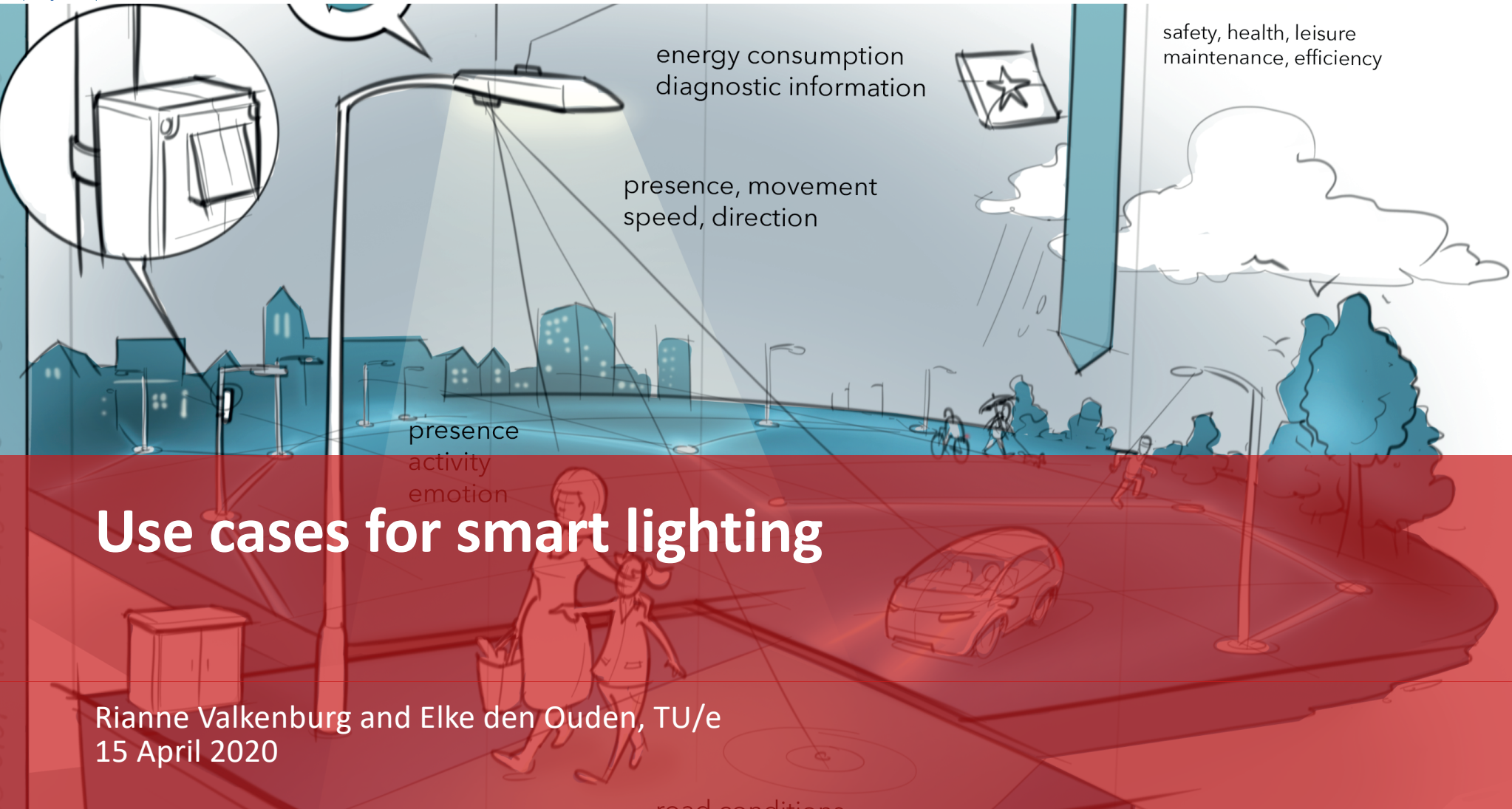




Use cases for smart lighting

Rianne Valkenburg and Elke den Ouden, TU/e
15 April 2020

Use cases for smart lighting

In the project Smart Space, we identified needs from stakeholders to create use cases for smart lighting. A use case reflects a specific need (e.g. safe passage) in a specific area (e.g. during nightlife). In this way different use of smart lighting is detailed in a storyboard – a viable description of interactive use, including the related constraints and requirements.

Here we bring together all use cases as a repertoire of different opportunities to use smartness in interactive lighting.

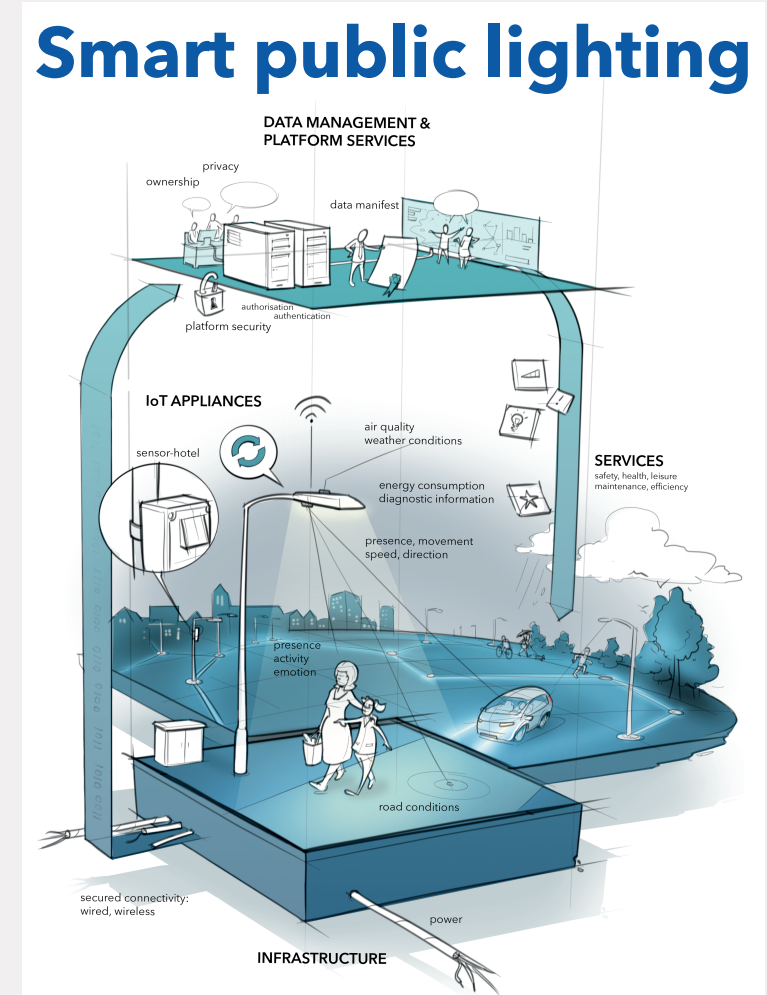
Content

Use cases

• <i>MC1</i> - Atmosphere and light experience in shopping street de Lange Delft in Middelburg	5
• <i>MR1</i> - Safe cycling and walking crossings on through roads at the Rooseveltlaan Middelburg	16
• <i>OS1</i> - Atmosphere and light experience in the station square Oostende	20
• <i>OE2</i> - Lively urban space evoking (social) activities in the Victorialaan and the connections in Oostende	31
• <i>SN1</i> - Atmosphere and light experience in shopping street the Stationsstraat in Sint-Niklaas.	40
• <i>SN3</i> - Perceived safety at the night life area Sint-Nicolaasplein in Sint-Niklaas	55
• <i>TT2</i> - Supporting event experiences on Liberty Square and connecting roads in Thurles	72
• <i>TT1</i> - Safe cycling and walking along mixed traffic roads (R-roads) in Thurles	89

Smart Lighting is lighting that enables people to use and enjoy public space, by providing the right light at the right moment, the right place, and with the right atmosphere.

By integrating sensors and software controls into the system, street lighting can be automatically adjusted to the actual local needs, realizing both efficiency in light energy consumption and a higher level of well-being for people.





Use case MC1 Lange Delft Middelburg

MC1.2 Providing identity and orientation



MC1.1 Passing-by safely and efficiently



MC1.3 Enhancing wandering around

MC1.4 Prolonging the stay



Atmosphere and light experience in shopping street Lange Delft in Middelburg

Need

People indicate the need for a pleasant and comfortable street scene, where light is designed for pedestrians and cyclists and the bright and dark show windows are integral part of the atmosphere.

Use case

To make the historical city centre an attractive shopping area, where people stay longer and return, different routes are created for different target groups with different (lighting) experience. The light plan for the entire area needs to be designed integral and consists of 4 different scenarios.

Scenario MC1.1 Passing-by safely and efficiently

Providing good visibility and a pleasant for people to pass-by safely and efficiently.
With well-designed lighting scenes at low light levels and different scenes that dim further over
the course of the evening and night.



Scenario MC1.1 Passing-by safely and efficiently		
Use case		Description
		Providing good visibility and a pleasant atmosphere for people to pass-by safely and efficiently. With well-designed lighting scenes at low light levels and different scenes that dim further over the course of the evening and night.
		Timing
		Always on
		People
		All people
		Activity
		Passing-by
Requirements system	Lighting	Desired state of users
		Safe and efficient
		Goal of the solution
		Good functional lighting
		Function of lighting
		Functional lighting level - light level as low as possible with sufficient homogeneity - adapted to seasons (flexibility)
		Function of 'smart'
		n.a.
Requirements system	Lighting	Type of lights
		General / public lighting (the basic lighting grid)
		Scenes
		Active: multiple dim scenarios with timer control
		Light level
		tbd
	Smart	Colour
		(Tunable) white
		Adjacent streets/areas
		Similar light levels
		Activation of the scene
		Timer control
		Deactivation of the scene
		Timer control
		Dynamics within the scene
		Dim scenarios over the evening and night - adjusted to other scenarios when needed
		Activation of the dynamics
		Timer control
		Deactivation of dynamics
		Timer control
		Data collection for system
		n.a.
		Data collection for learning
		n.a.

Scenario MC1.2 Providing identity and orientation

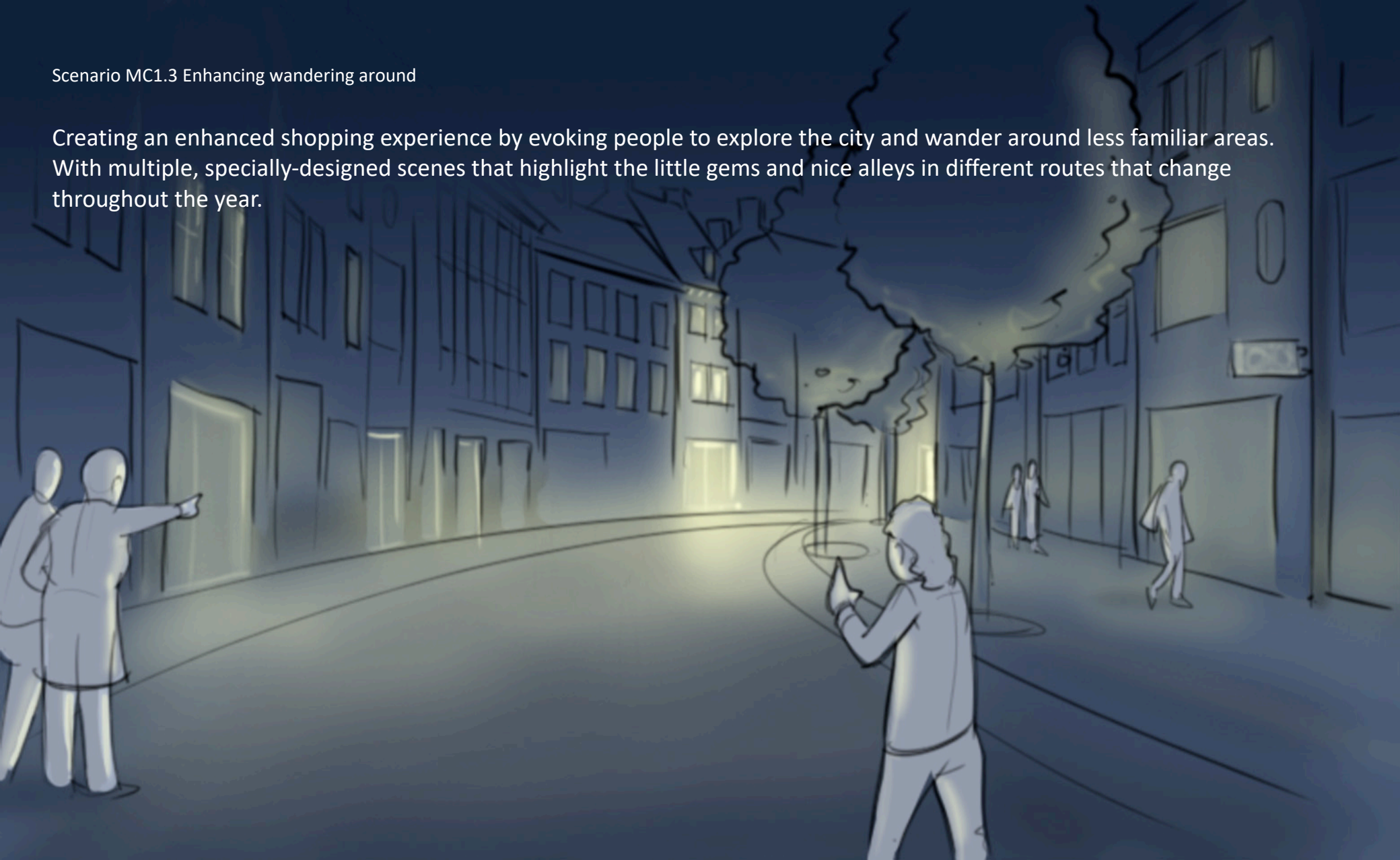
Creating landmarks around the city centre to emphasize the historical identity and to provide orientation. With facade lighting on the monumental buildings in the city at the lowest possible level with sufficient contrast.



Scenario MC1.2 Providing identity and orientation		
Use case		Description
		Creating landmarks around the city centre to emphasize the historical identity and to provide orientation. With facade lighting on the monumental buildings in the city at the lowest possible level with sufficient contrast.
		Timing
		Seasonal scheme
		People
		All people
		Activity
		Orientating
Requirements system	Lighting	Desired state of users
		Feeling at ease
		Goal of the solution
		Emphasize the monumental city
		Function of lighting
		Atmosphere creation through decorative facade lighting
		Function of 'smart'
		n.a.
	Lighting	Type of lights
		Existing facade lighting (out of project scope)
		Scenes
		Active: multiple dim scenarios with timer control
		Light level
		tbd
	Smart	Colour
		Existing
		Adjacent streets/areas
		Not too bright to ensure desired contrast
		Activation of the scene
		Timer and calendar control (integrated with other scenarios)
		Deactivation of the scene
		Timer and calendar control (integrated with other scenarios)
		Dynamics within the scene
		Dim scenarios over the evening and night - adjusted to other scenarios when needed
		Activation of the dynamics
		Timer control
		Deactivation of dynamics
		Timer control
		Data collection for system
		n.a.
		Data collection for learning
		n.a.

Scenario MC1.3 Enhancing wandering around

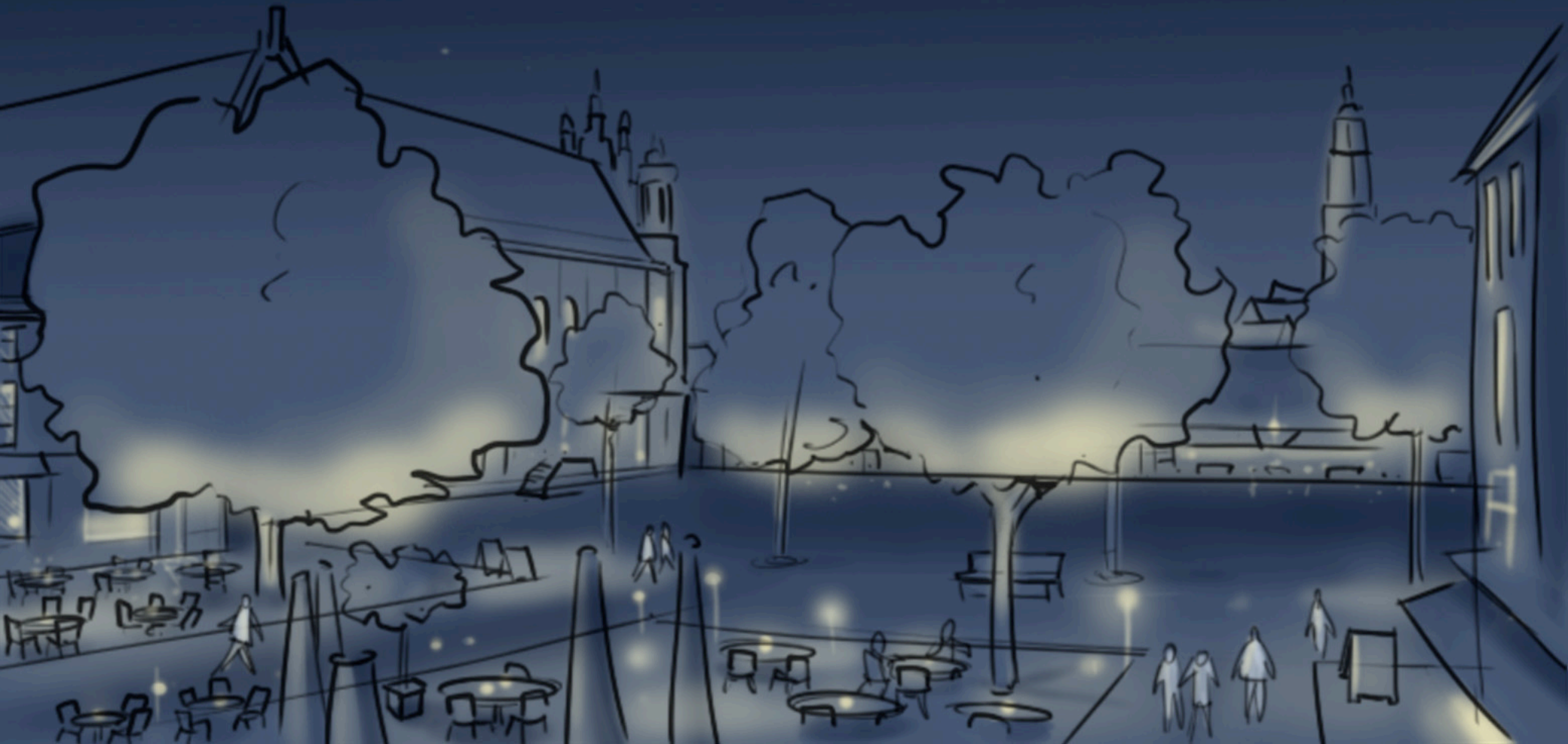
Creating an enhanced shopping experience by evoking people to explore the city and wander around less familiar areas. With multiple, specially-designed scenes that highlight the little gems and nice alleys in different routes that change throughout the year.



Scenario 3: MC1.3 Enhancing wandering around					
Use case		Description	Creating an enhanced shopping experience by evoking people to explore the city and wander around less familiar areas. With multiple, specially-designed scenes that highlight the little gems and nice alleys in different routes that change throughout the year.		
		Timing	Seasonal scheme		
		People	All people		
		Activity	Exploring		
		Desired state of users	Be surprised		
		Goal of the solution	Guiding people along interesting places in the city centre		Making people aware of the little hidden gems (small shops and special businesses) in the city
		Function of lighting	Creating an intentional route along shops, bars and restaurants through the city by highlighting different elements within visible range	Making people aware of the nice alleys adjacent to the more frequently used routes by creating a special atmosphere in the alleys	
		Function of 'smart'	n.a.		
Requirements system	Lighting	Type of lights	General / public lighting	Private lights of shop & building owners	General / public lighting
		Scenes	Active: multiple scenarios to refresh the experience over time (e.g. one scene per month)		Active: multiple dim scenarios with timer control
		Light level	tbd, low enough to allow sufficient contrast with highlighted gems	tbd, as low as possible but higher than general lighting to create sufficient contrast with the environment	tbd
		Colour	(Tunable) white	tbd (private owned)	Warm (sufficient colour contrast with basic lighting grid)
		Adjacent streets/areas	Not too bright to ensure desired contrast		
	Smart	Activation of the scene	Timer and calendar control (integrated with other scenarios)		
		Deactivation of the scene	Timer and calendar control (integrated with other scenarios)		
		Dynamics within the scene	n.a		
		Activation of the dynamics			
		Deactivation of dynamics			
		Data collection for system	n.a.		
		Data collection for learning	Presence and location of people		

Scenario MC1.4 Prolonging the stay

Providing an attractive and warm atmosphere on the squares to invite people to stay longer and have a drink or a bite. With a lighting scene that makes use of the features of the area in a layered lighting design, avoiding dark spots.



Scenario MC1.4 Prolonging the stay					
Use case		Description	Providing an attractive and warm atmosphere on the squares to invite people to stay longer and have a drink or a bite. With a lighting scene that makes use of the features of the area in a layered lighting design, avoiding dark spots.		
		Timing	Seasonal scheme		
		People	All people		
		Activity	Enjoying		
		Desired state of users	Feeling welcome		
		Goal of the solution	Making people aware of the possibilities and stay longer to enjoy the facilities in the area		
		Function of lighting	Atmosphere creation on the squares to draw people from the shopping street and have a good time on the square		
		Function of 'smart'	n.a.		
Requirements system		Lighting	Type of lights	General / public lighting	Private lighting of bars and restaurants
			Scenes	Static: fixed lighting scene to create an attractive atmosphere with a combination of public and private lighting	
			Light level	Sufficient to make people aware and draw their attention	
			Colour	(Tunable) white	tbd (private owned)
			Adjacent streets/areas	Not too bright to ensure desired contrast	
		Smart	Activation of the scene	Timer and calendar control (integrated with other scenarios)	
			Deactivation of the scene	Timer and calendar control (integrated with other scenarios)	
			Dynamics within the scene	n.a.	
			Activation of the dynamics		
			Deactivation of dynamics		
			Data collection for system	n.a.	
			Data collection for learning	Presence and location of people	



Use case MR1 Rooseveltlaan Middelburg

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

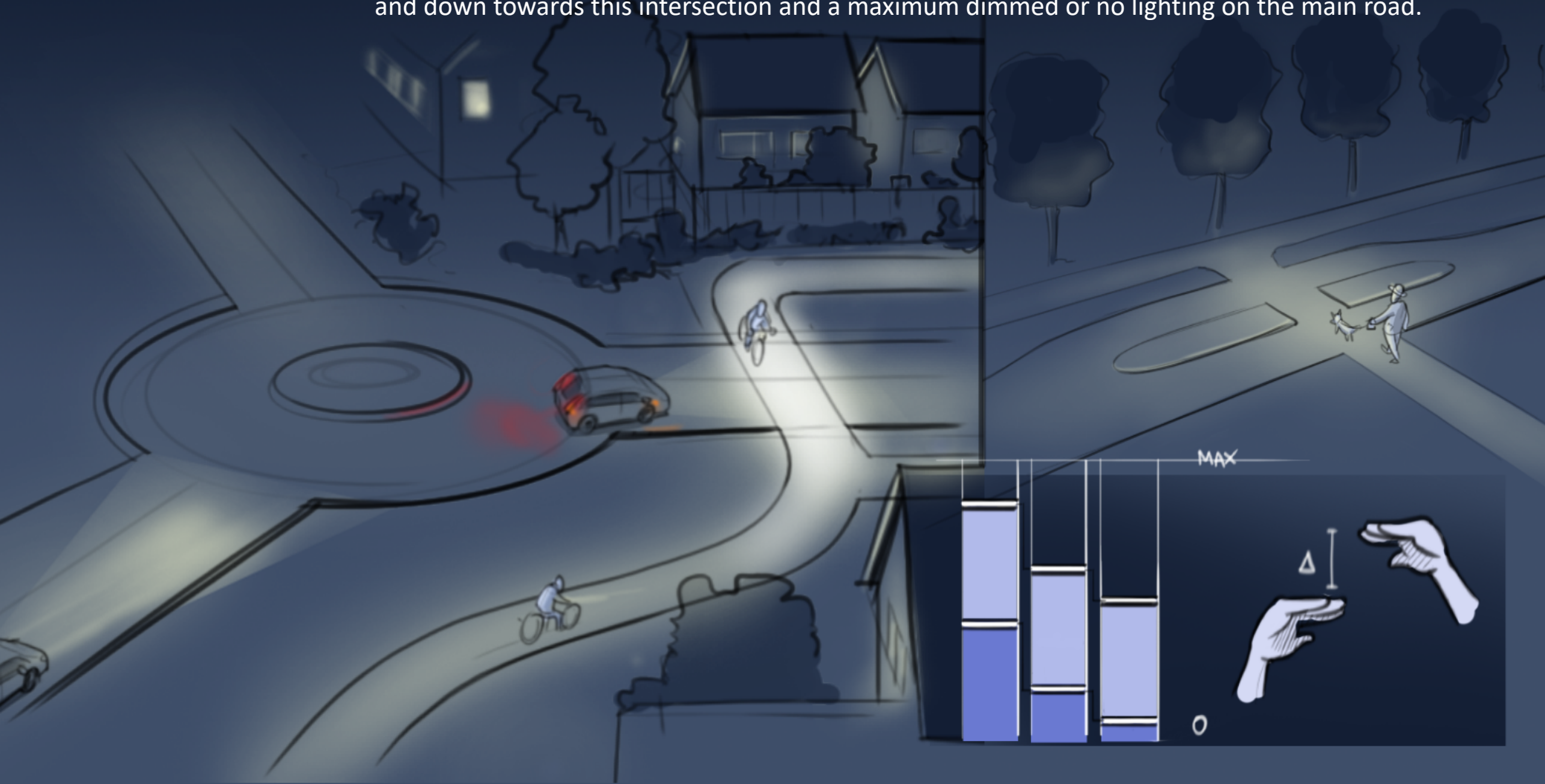
Need

People indicate that the main road needs to be not or much less lighted if safe crossings are created for intersecting traffic.

Use case

The storyboard of the interactive use consists of one scenarios that describes how good visibility of cyclists and pedestrians crossing the road is provided to increase their (perception of) safety. With multiple lighting scenes that dim further over the course of the evening and night, with constant contrast for a brightly illuminated crossing, a bicycle/footpath levelling up and down towards this intersection and a maximum dimmed or no lighting on the main road .

Providing good visibility of cyclists and pedestrians crossing the road to increase their (perception of) safety. With multiple lighting scenes that dim further over the course of the evening and night, with constant contrast for a brightly illuminated crossing, a bicycle/footpath levelling up and down towards this intersection and a maximum dimmed or no lighting on the main road.



Scenario: Crossing safely				
Use case		Description	Providing good visibility of cyclists and pedestrians crossing the road to increase their (perception of) safety. With multiple lighting scenes that dim further over the course of the evening and night, with constant contrast for a brightly illuminated crossing, a bicycle/footpath levelling up and down towards this intersection and a maximum dimmed or no lighting on the main road.	
		Timing	Every night - dusk till dawn	
		People	All people	
		Activity	Cycling and walking / car driving	
		Desired state of users	Feeling safe when crossing the road (cyclists and pedestrians) and safe driving (motorised driving)	
		Goal of the solution	Enable maximum dimming on roads with separate lanes for motorised traffic by increasing the visibility of crossings for pedestrians and cyclists	
		Function of lighting	Making car drivers aware of potential cyclists or pedestrians crossing the road at specific places	
		Function of 'smart'	n.a.	
Requirements system		Lighting	Type of lights	General lighting
			Scenes	Active: multiple dim scenarios with timer control
			Light level	As low as possible with sufficient contrast between the crossing, the bicycle/footpath and the main road. In built areas this means maximum dimmed and in unbuilt areas no lighting at all for the main road.
			Colour	White
			Adjacent streets/areas	Minimal light levels, ensuring sufficient contrast
		Smart	Activation of the scene	Timer control
			Deactivation of the scene	Timer control
			Dynamics within the scene	n.a.
			Activation of the dynamics	
			Deactivation of dynamics	
			Data collection for system	Initial measurement of the road use, to select the desired timeslots for dim scenarios
			Data collection for learning	Number of road users (walking, cycling and driving) and their speed.



Use case OS1 Stationsplein Oostende

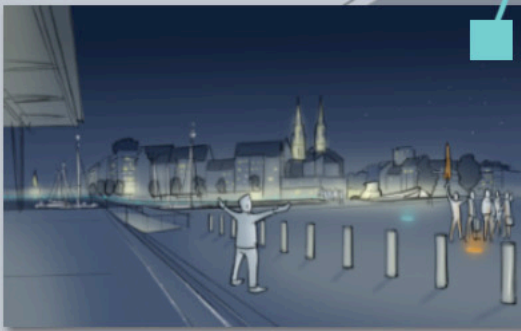
OS1.1 Walking safely



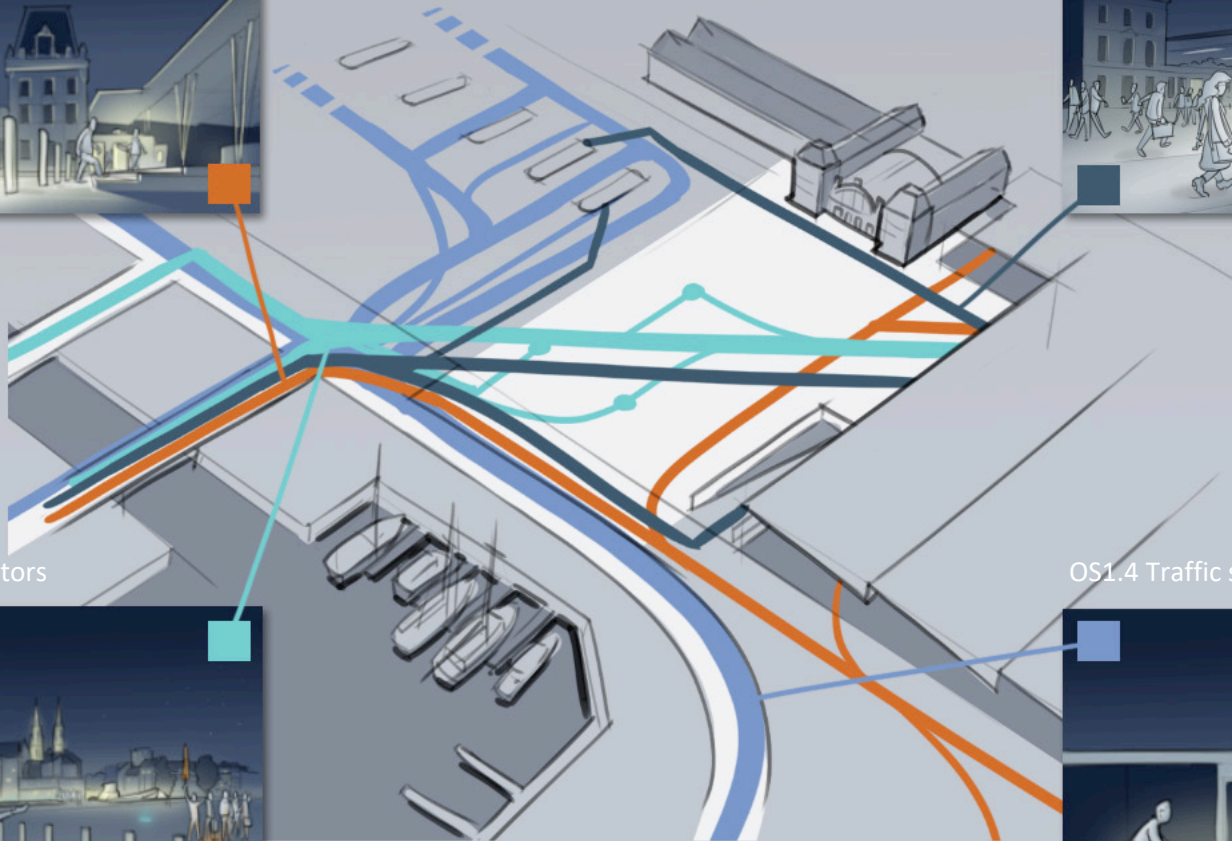
OS1.2 Commuting efficiently



OS1.3 Welcoming visitors



OS1.4 Traffic safety in shared space



Atmosphere and light experience in the station square Oostende

Need

People indicate the need for an attractive, cosy place to be and to stay with a comfortable atmosphere. A place that welcomes visitors into the city.

Use case

The total storyboard of the interactive use consists of 4 scenarios that reflect different use by different target groups, related by routes varying over time and place.

Scenario OS1.1 Walking safely

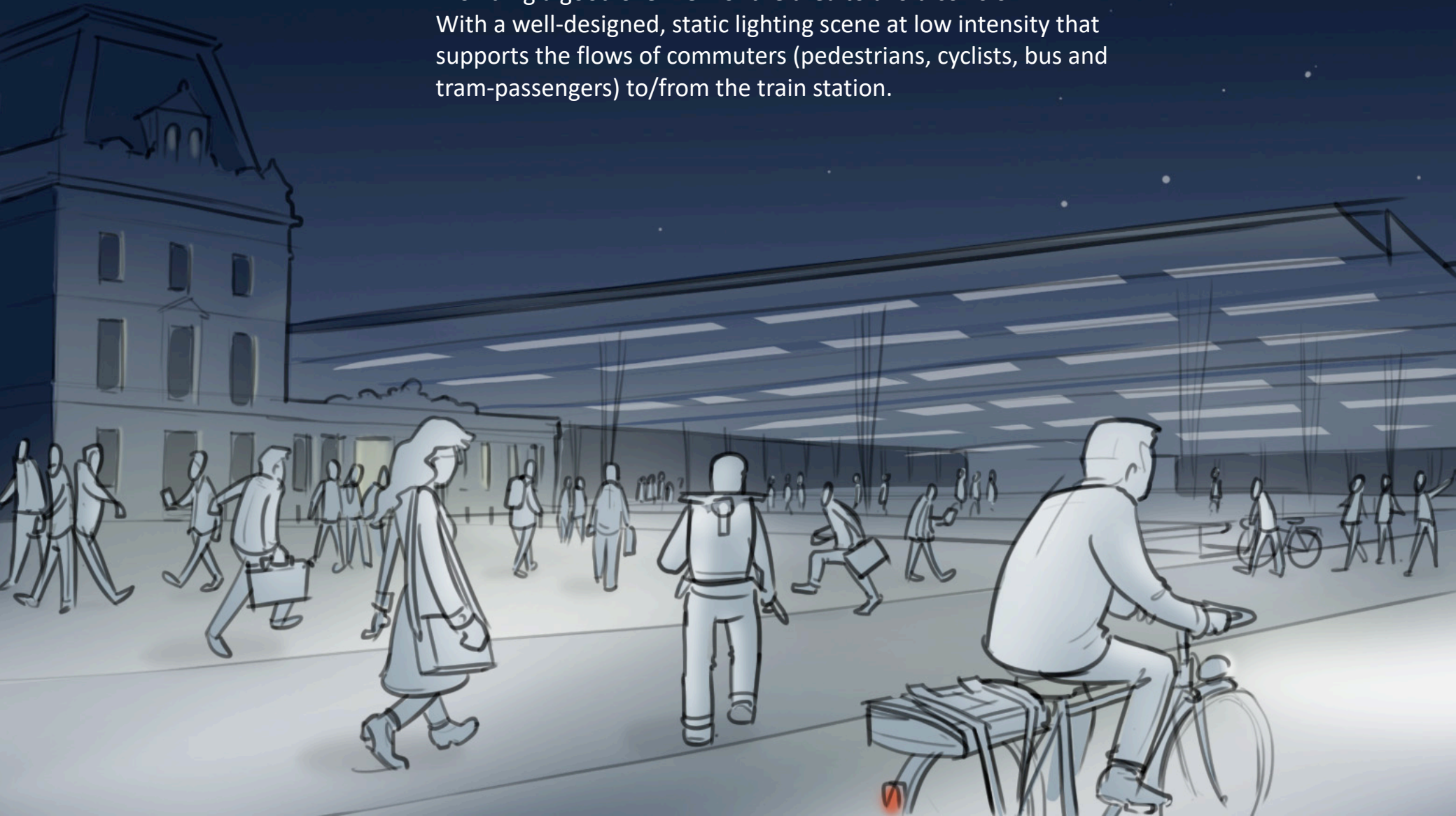
Providing a good overview of the area to guide pedestrians (mainly neighbouring residents) to their destination safely and comfortable. With a well-designed, static lighting scene at low intensity.



Scenario OS1.1 Walking safely				
Use case		Description	Providing a good overview of the area to guide pedestrians (mainly neighbouring residents) to their destination safely and comfortable. With a well-designed, static lighting scene at low intensity.	
		Timing	Morning & early evening	Evening
		People	Nearby residents: mainly elderly	Nearby residents: students
		Activity	Making use of the services in the train station (e.g. getting a newspaper)	Crossing the square on the way to the city centre
		Desired state of users	Being safe	
		Goal of the solution	Good functional lighting	
		Function of lighting	Creating good visibility for (elderly) people.	Creating good visibility for younger people (students)
		Function of 'smart'	n.a.	
Requirements system		Lighting	Type of lights	Public lighting
			Scenes	Static lighting scene
			Light level	Minimum lighting level, with good visibility for elderly (slightly higher)Minimum lighting level (slightly lower)
			Colour	Cool white
			Adjacent streets/areas	Ensure low contrast (similar light levels)
		Smart	Activation of the scene	Timer control, based on sunset
			Deactivation of the scene	Timer control
			Dynamics within the scene	n.a.
			Activation of the dynamics	
			Deactivation of dynamics	
			Data collection for system	n.a.
			Data collection for learning	Amount of people (presence and location), number of people tripling

Scenario OS1.2 Commuting efficiently

Providing a good overview of the area to avoid collision.
With a well-designed, static lighting scene at low intensity that supports the flows of commuters (pedestrians, cyclists, bus and tram-passengers) to/from the train station.



Scenario OS1.2 Commuting efficiently					
Use case		Description	Providing a good overview of the area to avoid collision. With a well-designed, static lighting scene at low intensity that supports the flows of commuters (pedestrians, cyclists, bus and tram-passengers) to/from the train station.		
		Timing	Peak hours: weekdays between 6:30/sunrise and 8:30	Peak hours: weekdays between 16:00/sunset and 19:00	
		People	Cyclists, pedestrians, bus and tram passengers		
		Activity	Catching the train, bus or tram	Returning	
		Desired state of users	Safe and efficient	Safe and efficient	
		Goal of the solution	Homogeneous lighting on the square		
		Function of lighting	Supporting large flows of people and providing good visibility.		
		Function of 'smart'	n.a.		
Requirements system		Lighting	Type of lights	Public lighting	
			Scenes	Static lighting scene	
			Light level	Minimum lighting level with good visibility	
			Colour	Cool white	
			Adjacent streets/areas	Ensure low contrast (similar light levels)	
		Smart	Activation of the scene	Timer control, calendar (working days)	
			Deactivation of the scene	Timer control	
			Dynamics within the scene	n.a.	
			Activation of the dynamics		
			Deactivation of dynamics		
			Data collection for system	n.a.	
			Data collection for learning	Amount of people (presence and location), number of disturbances/people bumping into each other, perception of efficiency and comfort	

Scenario OS1.3 Welcoming visitors

Creating a welcoming experience for people visiting the city (individual or in groups) or go out for a day-trip to easily find their friends and orient themselves. With bright spots and multiple lighting scenes changing through the seasons and lunar calendar.



Scenario OS1.3 Welcoming visitors							
Use case		Description	Creating a welcoming experience for people visiting the city (individual or in groups) or go out for a day-trip to easily find their friends and orient themselves. With bright spots and multiple lighting scenes changing through the seasons and lunar calendar.				
		Timing	Morning & early evening from September to March		Morning & early evening from September to March		
		People	Day-trippers visiting Oostende		Day-trippers leaving for elsewhere		
		Activity	Arriving & orienting	Meeting rest of the group			
		Desired state of users	Feeling welcome and recognising the 'smell and flavour' of Oostende	Feeling at ease			
		Goal of the solution	Creating a maximum atmosphere with minimum energy	Enabling people to find each other			
		Function of lighting	Showing the gems of Oostende	Creating a spot where people can meet			
		Function of 'smart'	n.a.	n.a.			
Requirements system		Lighting	Type of lights	Public lighting (on square and in the doc)	Existing facade lighting	Additional lighting (e.g. below seating elements or additional spots on public lighting)	
			Scenes	Active: multiple scenarios for different seasons and lunar calendar to adjust the lighting levels	Existing	Static lighting scene	
			Light level	Minimum, low enough to allow sufficient contrast with highlighted meeting points and monuments		Minimum, high enough to allow sufficient contrast with general lighting	
			Colour	Warm white light		RGB	
			Adjacent streets/areas	Ensure low contrast (similar light levels)		Not too bright to ensure visibility of the spot(s)	
		Smart	Activation of the scene	Timer control, calendar (lunar)		Timer control, calendar	
			Deactivation of the scene	Timer control		Timer control	
			Dynamics within the scene	n.a.		n.a.	
			Activation of the dynamics				
			Deactivation of dynamics				
			Data collection for system	n.a.			
			Data collection for learning	Amount of people (presence and location)			

Scenario OS1.4 Traffic safety in shared space

Providing a good overview of the area to ensure a safe passage through the shared space for all road users where nobody has absolute priority. With two well-designed lighting scene adapting to the bus calendar.



Scenario OS1.4 Traffic safety in shared space			
Use case		Description	Providing a good overview of the area to ensure a safe passage through the shared space for all road users where nobody has absolute priority. With two well-designed lighting scene adapting to the bus calendar.
		Timing	Dusk till dawn
		People	Bus drivers, bus passengers and other pedestrians & cyclists
		Activity	Using the shared space
		Desired state of users	Creating good visibility for everybody
		Goal of the solution	Ensure a safe space without collisions between different road users
		Function of lighting	Creating good visibility for everybody
		Function of 'smart'	n.a.
Requirements system	Lighting	Type of lights	Public lighting
		Scenes	Static with two scenes - during and outside bus operating hours
		Light level	Minimum lighting level with good visibility
		Colour	White
		Adjacent streets/areas	Ensure low contrast (similar light levels)
	Smart	Activation of the scene	Timer control, bus calendar
		Deactivation of the scene	Timer control
		Dynamics within the scene	n.a.
		Activation of the dynamics	
		Deactivation of dynamics	
		Data collection for system	n.a.
		Data collection for learning	Amount of people (presence and location), number of disturbances/people bumping into each other, perception of efficiency and comfort



Use case OE2 Victorialaan in Oostende



OE2.1 Interactive playing



OE2.2 Communal living room



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

Need

People indicate the need for a lively urban space where they can meet and do activities together. A space that evokes (social) activity and cohesion by evoking people to come and stay outside.

Use case

The total storyboard of the interactive use consists of 2 scenarios and reflect different use by different target groups. One aims for the walking facilities with water features in the Victoriastraat and one on the Central Park.

Scenario OE2.1 Interactive playing

Creating a fun and lively area that evokes people to be active to walk, play or enjoy the sun set experience together.

With specially-designed playful elements that interact with people, their movements and the environment (e.g. sun set experience or a good night kiss).



Scenario OE2.1 Interactive playing (1 of 2)

Use case	Description	Creating a fun and lively area that evokes people to be active to walk, play or enjoy the sun set experience together. With specially-designed playful elements that interact with people, their movements and the environment (e.g. sun set experience or a good night kiss).								
	Timing	End afternoon & early evening from autumn to spring		Beautiful sunsets all year round		Every evening and morning (before 23:00 and after 6:00)	Every evening around 23:00			
	People	Children and elderly		Everybody		Everybody	Everybody			
	Activity	Interactive playing		Doing something else		Strolling along	Doing something else			
	Desired state of users	Having fun		Enjoying the experience together		Comfortable	Enjoying the experience together			
	Goal of the solution	Evoke people to be physically and socially active		Drawing the people to a joint enhanced sunset experience		Comfortable and pleasant atmosphere	Drawing the people to a joint enhanced experience			
	Function of lighting	Enhanced atmosphere adapting to the situation with interactive lighting		Enhanced atmosphere		Contribute to the atmosphere	Light show as transition to the night scene			
	Function of 'smart'	Gaming element for different user groups at different times of the evening		Realtime sensing of 'quality' of the sunset and the colours		Real time reacting to light level	t.b.d.			
Requirements system	Lighting	Type of lights	Special lighting elements and/or projection	General public lighting	General public lighting	Special lighting elements	General public lighting	General public lighting	Special lighting elements	
		Scenes	Interactive: different play elements light up during use/playing	Static lighting scene	Interactive: adapting to the sunset in light level and colour		Interactive: light levels based on the weather conditions	Interactive: light show using the special lighting elements, with multiple lighting shows that are randomly displayed, with special experience on special days		
		Light level	Sufficiently bright to be clearly visible	Low level, to ensure clear visibility of the special lighting clearly	Gradient in light level towards the end of the street	Matching with the sunset itself	Pleasant at minimum level related to weather conditions at the walking lines, and highly dimmed at the road	Maximum dimmed (night scene)	t.b.d.	
		Colour	RGB	(Tunable) white	(Tunable) white	RGB	(Tunable) white	(Tunable) white	RGB	
		Adjacent streets/areas	Ensure low contrast (similar lighting levels)		Not too bright to ensure the visibility of the experience		Ensure low contrast (similar lighting levels)	Ensure low contrast (similar lighting levels - also dimming to night scene)		
			- to be continued on next page -							

Scenario OE2.1 Interactive playing

Creating a fun and lively area that evokes people to be active to walk, play or enjoy the sun set experience together.

With specially-designed playful elements that interact with people, their movements and the environment (e.g. sun set experience or a good night kiss).



Scenario OE2.1 Interactive playing (2 of 2)

Requirements system	Smart	Activation of the scene	Timer control, from autumn to spring - starting with a trigger or demo		Triggered by sunset and assessment of the quality	Surrounding light level sensor (too dark)
		Deactivation of the scene	Timer control		End of sunset	Between 23:00 and 6:00
		Dynamics within the scene	Multiple users can play a together or alone	n.a.	Matching the dynamics of the sunset in level and colour	Adaptive to surrounding light levels
		Activation of the dynamics	Participation of people		Sensor or camera that analyses the sunset	Continuous measuring with surrounding light level sensor
		Deactivation of dynamics	End of participation		End of sunset	n.a.
		Data collection for system	t.b.d. (depending on the interaction with the playing element)	n.a.	Quality and colours of the sun set. Surrounding light levels. Weather conditions.	Surrounding light levels (and thresholds for on/off and dimming)
		Data collection for learning	Amount of people present	n.a.	Amount of people present, weather conditions, their appreciation of the experience (e.g. through social media)	Amount of people strolling along in different weather conditions



Scenario OE2.2 Communal living room

Creating a pleasant and 'homey' atmosphere to invite residents and neighbouring residents to stay, relax and socialise together. With special designed lighting scenes that react to the presence of people and their activities, and invite others to join in.

Scenario OE2.2 Communal living room		
Use case		Description
		Creating a pleasant and ‘homey’ atmosphere to invite residents and neighbouring residents to stay, relax and socialise together. With special designed lighting scenes that react to the presence of people and their activities, and invite others to join in.
		Timing
		Dinner time (after/at sunset)
		People
		Everybody, incl. residents from adjacent neighbourhoods
		Activity
		Spending time together (e.g. in a handy craft market, or preparing food together)
Requirements system	Lighting	Desired state of users
		Having fun together
		Goal of the solution
		Drawing people together to spend time together
		Function of lighting
		Creating a pleasant and 'homey' atmosphere
		Function of 'smart'
		Detecting the presence of people and notify others through an app or message
	Lighting	Type of lights
		Special lighting elements
		Scenes
		Reacts on the presence of people and the activity they are doing
		Light level
	Smart	Pleasant and cosy
		Colour
		t.b.d.
		Adjacent streets/areas
		Not too bright to ensure the visibility of the experience
		Activation of the scene
		Timer control
		Deactivation of the scene
		Timer control
		Dynamics within the scene
		Activation of the dynamics
		n.a.
		Deactivation of dynamics
		Data collection for system
		Presence of people, detecting type of activity
		Data collection for learning
		Amount of people present, amount of people that install the app/subscribe for the notifications, amount of people that react to notifications, their appreciation of the experience



Use case SN1 Stationsstraat Sint-Niklaas

SN1.6 (Un)Loading and commuting safely



SN1.1 Commuting safely on a temporary cycle lane



SN1.4 Passing-by in a pleasant atmosphere and safely in the night



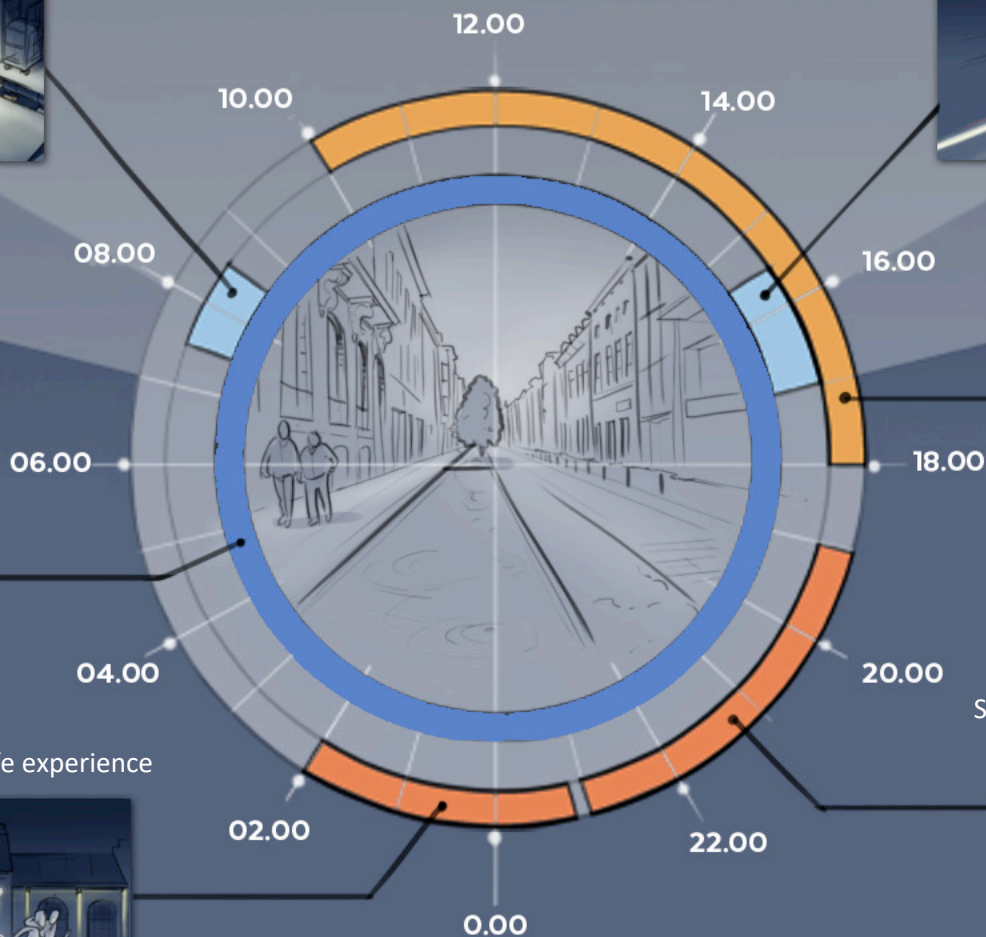
SN1.5 Enhanced night life experience



SN1.2 Playful interaction



SN1.3 Enhanced shopping experience



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

Need

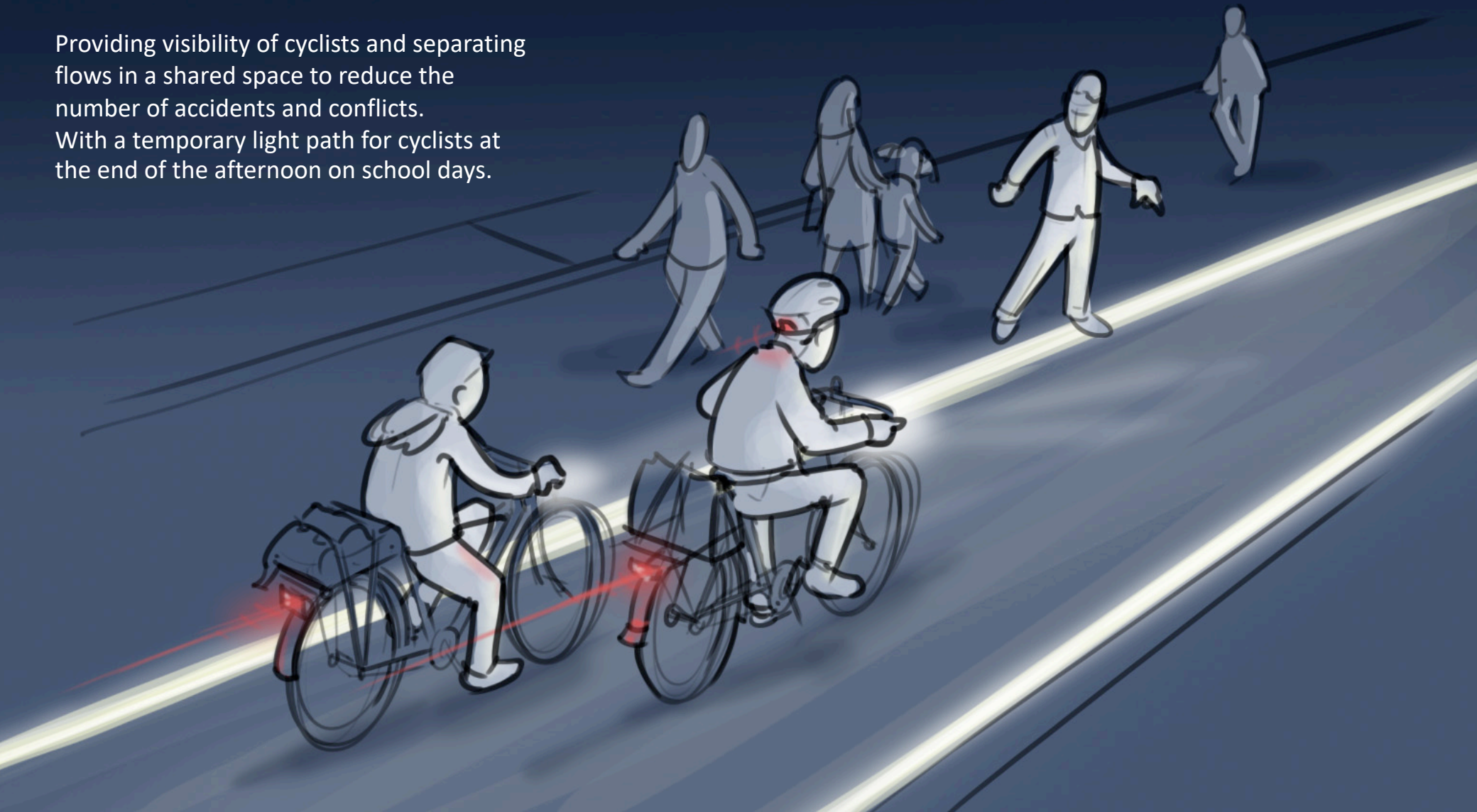
People indicate the need a pleasant and cosy street scene, where light is designed for pedestrians and cyclists and the bright and dark shop windows are integral part of the atmosphere.

Use case

The total storyboard of the interactive use consists of 6 scenarios that reflect different use by different target groups, related by timing over the day and night. The aim is to dim the light as much as possible, while creating equality and a nice atmosphere.

Scenario SN1.1 Commuting safely on a temporary cycle lane

Providing visibility of cyclists and separating flows in a shared space to reduce the number of accidents and conflicts.
With a temporary light path for cyclists at the end of the afternoon on school days.



Scenario SN1.1 Commuting safely on a temporary cycle lane		
Use case		Description
		Providing visibility of cyclists and separating flows in a shared space to reduce the number of accidents and conflicts. With a temporary light path for cyclists at the end of the afternoon on school days.
		Timing
		End of the afternoon on school days
		People
		Pupils
		Activity
		Cycling
Requirements system	Lighting	Desired state of users
		Safe and fast moving between pedestrians
		Goal of the solution
		Less accidents and conflicts between cyclists and pedestrians
		Function of lighting
		Clearly visible lane for cyclists
		Function of 'smart'
		n.a.
	Lighting	Type of lights
		Public lighting and/or additional lights
		Scenes
		Static: light path for cyclists
		Light level
	Smart	P2 Sufficient contrast with environment
		Colour
		t.b.d.
		Adjacent streets/areas
		n.a.
		Activation of the scene
		Timer control (end of school) & calendar (school days)
		Deactivation of the scene
		Timer control
		Dynamics within the scene
		Activation of the dynamics
		n.a.
		Deactivation of dynamics
		Data collection for system
		Initial measurement of amount and position of pedestrians and cyclists during afternoons on school days
		Data collection for learning
		Amount and position of pedestrians. Amount and position of cyclists.

Scenario SN1.2 Playful interaction

Creating a fun get-together setting where users can play and spend more time outside together.
With an interactive lighting installation that enables users to create and display personal content real time.



Scenario SN1.2 Playful interaction			
Use case		Description	Creating a fun get-together setting where users can play and spend more time outside together. With an interactive lighting installation that enables users to create and display personal content real time.
		Timing	End of the afternoon on school days
		People	Pupils
		Activity	Lingering and chilling
		Desired state of users	Having fun time together
		Goal of the solution	Making people stay longer and contribute to a nice atmosphere and liveliness
		Function of lighting	Projection of user content on wall or floor
		Function of 'smart'	With the help of an app people can create content and project to the floor or a wall
Requirements system	Lighting	Type of lights	Projector / beamer
		Scenes	Interactive: real time user content projection
		Light level	Sufficient contrast with environment
		Colour	RGB projection
		Adjacent streets/areas	Not too bright to reduce required light level of projection
	Smart	Activation of the scene	Timer control (end of school) & calendar (school days)
		Deactivation of the scene	Timer control
		Dynamics within the scene	Multiple users can project content after each other Multiple users can create content together - e.g. drawing
		Activation of the dynamics	Smart phone app
		Deactivation of dynamics	Timer and/or after 15 min. Inactivity
		Data collection for system	n.a.
		Data collection for learning	Amount of people

Scenario SN1.3 Enhanced shopping experience

Creating a warm atmosphere and extra surprising experience to make people enjoy the environment and keep coming back. With multiple lighting scenes that light up different historical buildings, to refresh the experience regularly and keep it lively all year round.



Scenario SN1.3 Enhanced shopping experience			
Use case		Description	Creating a warm atmosphere and extra surprising experience to make people enjoy the environment and keep coming back. With multiple lighting scenes that light up different historical buildings, to refresh the experience regularly and keep it lively all year round.
		Timing	Shopping hours & weekends
		People	Shoppers & visitors
		Activity	Shopping / visiting
		Desired state of users	Extra experience and service so people keep returning
		Goal of the solution	Creating maximum and changing atmosphere with minimum energy
		Function of lighting	Atmosphere creation through decorative facade lighting
		Function of 'smart'	n.a.
Requirements system	Lighting	Type of lights	Facade lighting
		Scenes	Active: multiple scenes for facade lighting to keep it lively all year round, related to special events or activities (e.g. Huis van de Sint).
		Light level	Minimum to create a nice atmosphere
		Colour	t.b.d.
		Adjacent streets/areas	Ensure low contrast (similar lighting levels)
	Smart	Activation of the scene	Timer control & calendar (planned scenes)
		Deactivation of the scene	Timer control
		Dynamics within the scene	n.a.
		Activation of the dynamics	
		Deactivation of dynamics	
		Data collection for system	n.a.
		Data collection for learning	Amount of people

Scenario SN1.4 Passing-by in a pleasant atmosphere and safely in the night

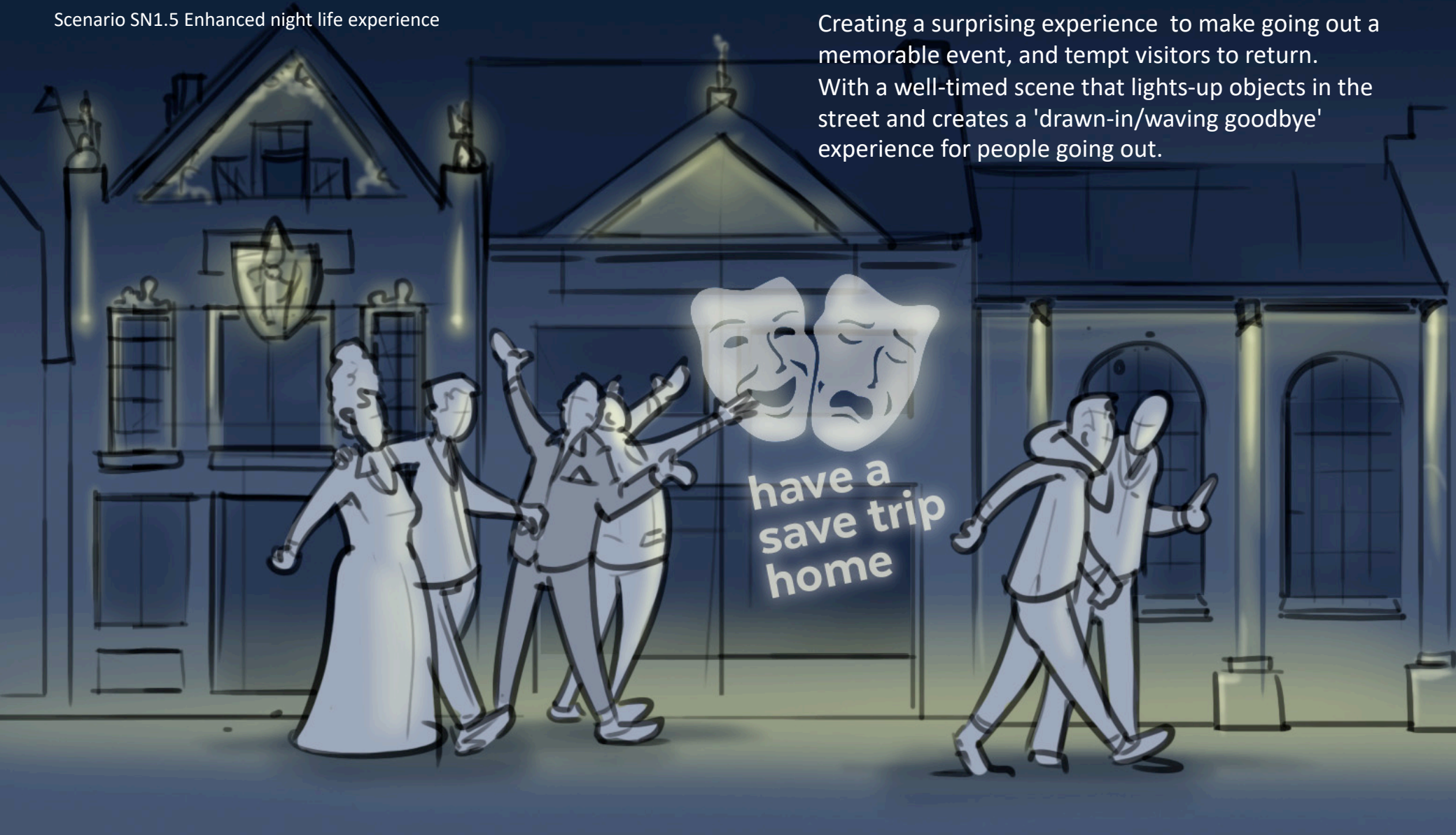
Providing a pleasant atmosphere and a feeling of safety for people to pass-by.

With well-designed lighting scenes at low light levels that dim further over the course of the evening and night, adapting the public lighting to the available (private) lighting in the area.



Scenario SN1.4 Passing-by in a pleasant atmosphere and safely in the night			
Use case		Description	Providing a pleasant atmosphere and a feeling of safety for people to pass-by. With well-designed lighting scenes at low light levels that dim further over the course of the evening and night, adapting the public lighting to the available (private) lighting in the area.
		Timing	Always (when lighting is required)
		People	Employees, residents and passers-by
		Activity	Passing by (also through traffic to station), going home, walking the dog
		Desired state of users	Feel safe and at ease
		Goal of the solution	Creating a feeling of comfort and safety with minimum energy
		Function of lighting	Lowest lighting level, very homogeneous, sufficient for police camera's
		Function of 'smart'	n.a.
Requirements system	Lighting	Type of lights	Public lighting
		Scenes	Active: multiple scenes to adapt the public lighting to the available lighting (emitted by shop windows, facades, private lighting etc.) through regular measurements and agreements with shop and building owners to be able to dim as deep as possible.
		Light level	Minimum to create a nice atmosphere
		Colour	Tuneable white
		Adjacent streets/areas	Ensure low contrast (similar lighting levels)
	Smart	Activation of the scene	Timer control & calendar (planned scenes)
		Deactivation of the scene	Timer control
		Dynamics within the scene	n.a.
		Activation of the dynamics	
		Deactivation of dynamics	
		Data collection for system	Initial measurement of the surrounding lighting over the course of the evening (emitted by shop windows, facades, private lighting)
		Data collection for learning	Amount of people

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.



Scenario SN1.5 Enhanced night life experience					
Use case		Description	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.		
		Timing	Evenings on Wednesdays to Sundays		
		People	People going out		
		Activity	Going out	Going home	
		Desired state of users	Nice atmosphere and safety on their way to the movies, concert, etc.	Nice atmosphere and safety on their way home	
		Goal of the solution	Making people feel welcome, drawing people into the street, so they stay longer	Waving people goodbye with a wink, so they return more often	
		Function of lighting	Dynamic attraction points through the street	Say goodbye to people heading home	
		Function of 'smart'	n.a.	n.a.	
Requirements system		Lighting	Type of lights	Public lighting and special lighting elements on facades or greenery	t.b.d.
			Scenes	Active: multiple scenes e.g. through special themes related to events (movies, concerts)	t.b.d.
			Light level	Minimum to create a nice atmosphere	
			Colour	t.b.d.	
			Adjacent streets/areas	Ensure low contrast (similar lighting levels)	
		Smart	Activation of the scene	Timer control & calendar (planned scenes Wed - Sun)	
			Deactivation of the scene	Timer control	
			Dynamics within the scene	n.a.	
			Activation of the dynamics		
			Deactivation of dynamics		
			Data collection for system	Regular measurement (e.g. quarterly) of flows of people (incl. walking speed when entering or leaving the street) on nightlife evenings, to ensure right timing of lighting up attraction points	
			Data collection for learning	Presence and location of people. Appreciation of the experience	

Scenario SN1.6 (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, reacting to the presence of vans, to warn cyclists.



Scenario SN1.6 (Un)Loading and commuting safely			
Use case		Description	Creating good visibility to avoid accidents between loading and unloading delivery vans and commuting cyclists and pedestrians. With a brighter area around parked vans, reacting to the presence of vans, to warn cyclists.
		Timing	Early morning (working/schooldays)
		People	Truck drivers & builders vs. pupils & commuters
		Activity	Loading / unloading vs. going to school /work
		Desired state of users	Safe and efficient
		Goal of the solution	Ensuring safety during (un)loading between commuting cyclists and pedestrians
		Function of lighting	Bright area/spot
		Function of 'smart'	Detecting presence and position of vans
Requirements system	Lighting	Type of lights	Public lighting
		Scenes	Multiple lighting scenes (bright area on and off), reacting to the presence or absence of vans
		Light level	high (spot)
		Colour	White
		Adjacent streets/areas	Ensure low contrast (similar lighting levels)
	Smart	Activation of the scene	Timer control & presence of vans
		Deactivation of the scene	Absence of vans
		Dynamics within the scene	n.a.
		Activation of the dynamics	
		Deactivation of dynamics	
		Data collection for system	Presence and position of parked vans
		Data collection for learning	Number and position of parked vans, duration of stay of parked vans

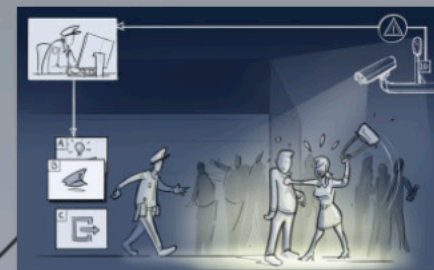


Use case SN3 Sint-Nicolaasplein Sint-Niklaas

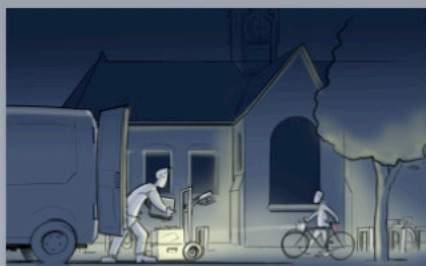
SN3.3 Enhanced night life atmosphere at north side



SN3.1 Protecting safety



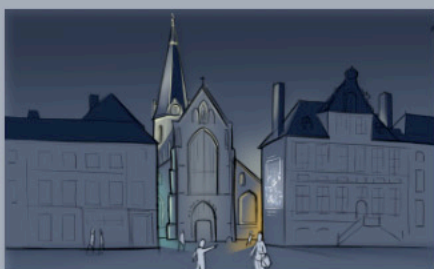
SN3.5 (Un)Loading and parking bikes safely



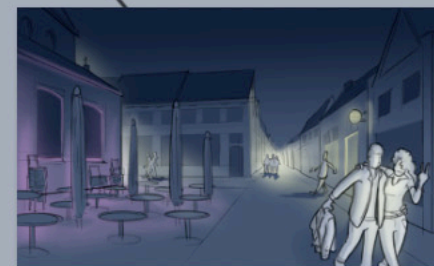
SN3.2 Enhanced night life atmosphere at south side



SN3.6 Inviting people to join



SN3.4 Time to go home



SN3.7 Passing-by safely



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

Need

People indicate the need for a nice and safe night life atmosphere, where unwanted behaviour is avoided and surveillance is supported.

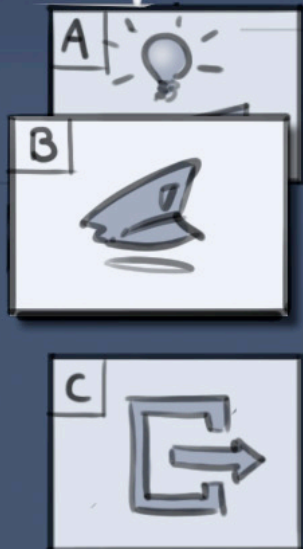
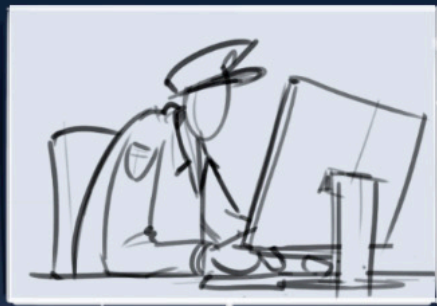
Use case

The total storyboard of the interactive use consists of 7 scenarios that reflect different use by different target groups, related by the position within the area.

Scenario SN3.1 Protecting safety

Ensuring safety on the entire square by supporting the guards in their jobs with technology to detect and locate incidents and de-escalate aggressive behaviour, as well as lighting up available escape routes to enable smooth evacuation of the square in case of calamity.

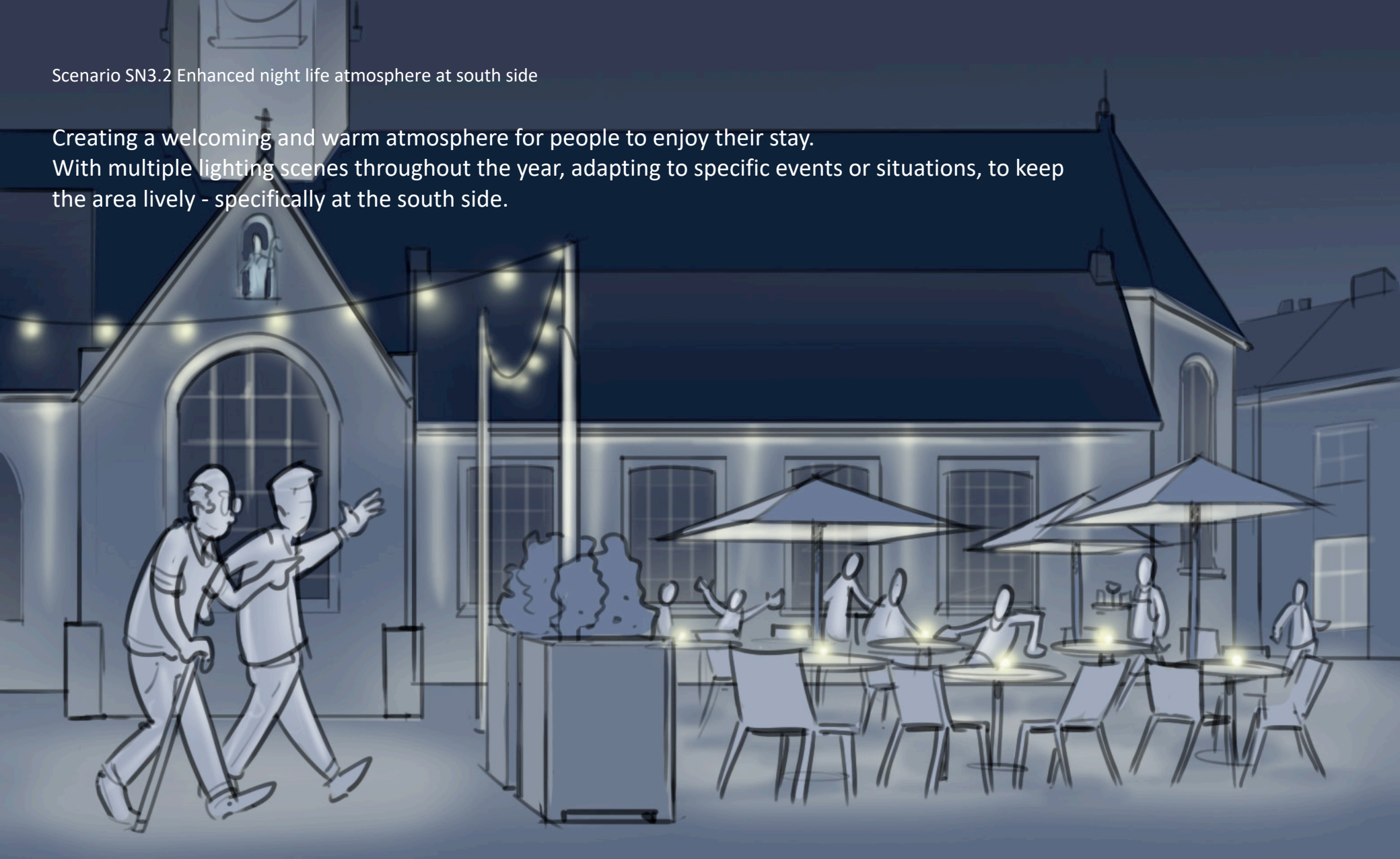
With an interactive system that reports the occurrence and location of incidents to the control room, reacts with controllable light spots and supports different evacuation routes in case of calamities.



Scenario SN3.1 Protecting safety								
Use case		Description	Ensuring safety on the entire square by a supporting the guards in their jobs with technology to detect and locate incidents and de-escalate aggressive behaviour, as well as lighting up available escape routes to enable smooth evacuation of the square in case of calamity. With an interactive system that reports the occurrence and location of incidents to the control room, reacts with controllable light spots and supports different evacuation routes in case of calamities.					
		Timing	On busy nights out					
		People	Control room police					
		Activity	Detecting incidents and calamities	Provide warning to rebels	Activate local security guards	Activate evacuation		
		Desired state of users	Safe and pleasant area	De-escalation without intervention	De-escalation with intervention	Reliable incident detection (no false alarms, no missed incidents) & fast and controlled evacuation		
		Goal of the solution	Creating safety in night time situations			Creating safety in emergency situations		
		Function of lighting	Ensuring good visibility for camera's regardless of the lighting scenarios and levels	De-escalate by special scene or lighting up the location of the incident with controllable light spot	n.a. (sensing only)	Create light corridors to indicate safe escape routes		
		Function of 'smart'	Detection of incidents and location(e.g. through 3D sound camera's)					
Requirements system		Lighting	Type of lights	Infrared light and camera's	General lighting	n.a.	General lighting & special lighting elements	
			Scenes	t.b.d.	Reactive: multiple lighting scenes (e.g. bright spot)		Interactive: different evacuation routes based on location of calamity	
			Light level	n.a. (infrared)	High (spots)		High (escape routes)	
			Colour		White		White, RGB	
			Adjacent streets/areas		Not too bright to reduce required light level of light spot		Ensure low contrast (similar lighting levels)	
		Smart	Activation of the scene	n.a.	Incident detection by system, activation by control room	n.a.	Incident detection by system, activation by control room	
			Deactivation of the scene		Control room		Control room	
			Dynamics within the scene	n.a.			Extra attention to available, safe escape routes, guiding lights to exits of the square	
			Activation of the dynamics				Control room based on location of calamity and progress of the evacuation	
			Deactivation of dynamics				Control room	
			Data collection for system	Incidents and location				Calamity and location
			Data collection for feedback	Amount and location of incidents/calamities				

Scenario SN3.2 Enhanced night life atmosphere at south side

Creating a welcoming and warm atmosphere for people to enjoy their stay.
With multiple lighting scenes throughout the year, adapting to specific events or situations, to keep the area lively - specifically at the south side.



Scenario SN3.2 Enhanced night life atmosphere at south side				
Use case	Description		Creating a welcoming and warm atmosphere for people to enjoy their stay. With multiple lighting scenes throughout the year, adapting to specific events or situations, to keep the area lively - specifically at the south side.	
	Timing		Evenings (Wed-Sun)	
	People		Young visitors	
	Activity		Visiting pubs and events	
	Desired state of users		Enjoying themselves	
	Goal of the solution		Contribute to atmosphere and sense of safety	
	Function of lighting		Pleasant atmosphere, adapting to season or events	Enhanced atmosphere adapting to the situation, events Avoiding dark spaces with façade lighting (e.g. dark recessed doors)
	Function of 'smart'		n.a.	
Requirements system	Lighting	Type of lights	General lighting	Decorative lighting (e.g. on and between the terraces) Façade lighting church - especially lower elements
		Scenes	Active: multiple scenarios based on activities (one scene per evening)	
		Light level	t.b.d. (low - medium)	
		Colour	Tuneable white	White, RGB White
		Adjacent streets/areas	Not too bright to reduce required light level of special lighting	
	Smart	Activation of the scene	Timer control & calendar (planned scenes related to event calendar?)	
		Deactivation of the scene	Timer control (activating other scenario)	Timer control
		Dynamics within the scene	n.a.	
		Activation of the dynamics		
		Deactivation of dynamics		
		Data collection for system	n.a.	
		Data collection for learning	Presence and location of people.	

Scenario SN3.3 Enhanced night life atmosphere at north side

Creating a welcoming and warm atmosphere for people to enjoy their stay.
With multiple lighting scenes throughout the year, adapting to specific events or situations, to keep the area lively - specifically at the north side.



Scenario SN3.3 Enhanced night life atmosphere at north side				
Use case	Description		Creating a welcoming and warm atmosphere for people to enjoy their stay. With multiple lighting scenes throughout the year, adapting to specific events or situations, to keep the area lively - specifically at the north side.	
	Timing		Evenings (Wed-Sun)	
	People		General public	
	Activity		Strolling and residing	
	Desired state of users		Enjoying themselves	
	Goal of the solution		Contribute to atmosphere and sense of safety	
	Function of lighting		Creating longer lines of sight to provide a good overview over the area	Avoiding dark spaces with façade lighting (e.g. dark recessed doors) Pleasant atmosphere, adapting to season or events
	Function of 'smart'		n.a.	
Requirements system	Lighting	Type of lights	Decorative lighting (e.g. trees, facades)	Façade lighting church - especially lower elements General lighting
		Scenes	Active: multiple scenarios based on activities (one scene per evening)	
		Light level	t.b.d. (low - medium)	
		Colour	White, RGB	White Tuneable white
		Adjacent streets/areas	Not too bright to reduce required light level of special lighting	
	Smart	Activation of the scene	Timer control & calendar (planned scenes related to event calendar?)	
		Deactivation of the scene	Timer control Timer control (activating other scenario)	
		Dynamics within the scene	n.a.	
		Activation of the dynamics		
		Deactivation of dynamics		
		Data collection for system	n.a.	
		Data collection for learning	Presence and location of people.	

Scenario SN3.4 Time to go home

Creating a cool and unpleasant atmosphere to warn people subtly that the evening is ending and ensuring they will leave the square and avoid lingering around when the pubs are closed. With multiple lighting scenes to increase light levels when people linger around and deeply dim when they have left, reacting to the presence (or absence) of people.



Scenario SN3.4 Time to go home							
Use case		Description	Creating a cool and unpleasant atmosphere to warn people subtly that the evening is ending and ensuring they will leave the square and avoid lingering around when the pubs are closed. With multiple lighting scenes to increase light levels when people linger around and deeply dim when they have left, reacting to the presence (or absence) of people.				
		Timing	Late evenings (Wed-Sun)				
		People	Visitors				
		Activity	Leaving				
		Desired state of users	Gentle ending of a nice evening and avoiding lingering around				
		Goal of the solution	Gentle warning that pubs will close soon, so people can leave the square smoothly				
		Function of lighting	Creating a less pleasant atmosphere to avoid people lingering around after closing time	Dimming and switching off, to create a neutral atmosphere	Creating a light corridor to indicate exits in a subtle way		
		Function of 'smart'	Presence and absence of people				
		Requirements system		Lighting		Type of lights	General lighting
Scenes	Reactive: slowly increasing and dimming lighting levels					Active: slowly dimming lighting levels of decorative lighting	Static: highlighting the exits routes (same as evacuation routes)
Light level	t.b.d. (medium - high)					Off	t.b.d. (medium - high)
Colour	Tuneable white					n.a.	White
Adjacent streets/areas	Ensure low contrast (similar lighting levels)						
Smart				Activation of the scene	Timer control & calendar (planned scenes related to event calendar?)		
				Deactivation of the scene	Timer control (activating other scenario)	Timer control	
				Dynamics within the scene	Increasing light levels from specific moment until all (?) people have left, then go back to normal setting (deeply dimmed)	Decreasing light levels from specific moment	Increasing light levels from specific moment until all (?) people have left, then go back to normal setting (deeply dimmed)
				Activation of the dynamics	Timer control		
				Deactivation of dynamics	Timer or absence of people		
				Data collection for system	Presence of people (when everybody left, the scenario can be turned off)		
				Data collection for learning	How much time is needed for all people to leave.		

Scenario SN3.5 (Un)Loading and parking bikes safely

Providing a good overview of the area for people to use the bike parking safely and create good visibility for efficiently unloading of goods for the café's and restaurants - specifically at the north side. With a well-designed lighting scene at a low intensity, avoiding dark spots and create bright sport for parked vans or cars, when present.



Scenario SN3.5 (Un)Loading and parking bikes safely			
Use case		Description	Providing a good overview of the area for people to use the bike parking safely and create good visibility for efficiently unloading of goods for the café's and restaurants - specifically at the north side.
		With a well-designed lighting scene at a low intensity, avoiding dark spots and create bright sport for parked vans or cars, when present.	
		Timing	On early mornings during weekdays
		Evenings (Wed-Sun)	
		People	Tenants
		Cyclists	
		Activity	Loading and unloading
		Park/fetch bicycle	
		Desired state of users	work efficient
		Feel safe and ensure bike is stalled safely	
		Goal of the solution	Good, functional lighting
		Good, functional lighting	
		Function of lighting	Functional lighting levels
		Homogeneous lighting to feel safe and enable social control	
		Function of 'smart'	Detection of vans/trucks
		n.a.	
Requirements system		Type of lights	General lighting
		General lighting	
		Scenes	Highlighted (un)loading zone, reacting to the presence of vans/cars
		Static: homogeneous lighting of parking area	
		Light level	t.b.d. (medium - high)
		t.b.d. (low - medium)	
		Colour	White
		White	
		Adjacent streets/areas	n.a.
		Ensure low contrast (similar lighting levels)	
		Activation of the scene	Timer control & calendar (to differentiate between days of the week)
		Timer control & calendar (planned scenes related to event calendar?)	
		Deactivation of the scene	Timer control
		Timer control	
		Dynamics within the scene	Highlighting the (un)loading zone
		Activation of the dynamics	Presence detection (detecting delivery vans specifically)
		n.a.	
		Deactivation of dynamics	Timer or absence of vans
		Data collection for system	Presence of vans/cars
		n.a.	
		Data collection for learning	Presence and location of vans. Duration of stay.
		Number of people. Time of arrival/departure.	

Scenario SN3.6 Inviting people to join

Creating a welcoming entrance to the square in front of the church entrance to make people aware of the activities on Sint-Nicolaasplein and to invite them to take a look and enjoy themselves.

With multiple lighting scenes that highlight the higher elements of the church facade (to be seen from the market place) and the side walls of the 'entrance'. changing according to the event or the season.



Scenario SN3.6 Inviting people to join						
Use case		Description	Creating a welcoming entrance to the square in front of the church entrance to make people aware of the activities on Sint-Nicolaasplein and to invite them to take a look and enjoy themselves.With multiple lighting scenes that highlight the higher elements of the church facade (to be seen from the market place) and the side walls of the 'entrance'. changing according to the event or the season.			
		Timing	Afternoon/evening of days on which special events or activities are scheduled			
		People	Potentially interested people			
		Activity	Doing something else		Arriving at the square	
		Desired state of users	Discovering or experiencing something new		Nice atmosphere and clear orientation on what is happening left and right of the church	
		Goal of the solution	Drawing people from the Grote Market to the square through the main entrance		Creating two equivalent but different routes left and right of the church	
		Function of lighting	Drawing attention and give a preview of the pleasant atmosphere on the square, and supporting equivalent routes to the left and right		Creating a different, easy understandable atmosphere on north and south side	
		Function of 'smart'	n.a.			
Requirements system		Lighting	Type of lights	Façade lighting church - especially higher elements	Projection on the side wall of the 'main entrance'	Façade lighting church - especially lower elements
			Scenes	Active: multiple lighting scenes based on activities (one per evening)	t.b.d.	Active: multiple lighting scenes based on activities (one scene per evening)
			Light level	t.b.d. (medium)	t.b.d. (medium - high)	t.b.d. (medium)
			Colour	White, RGB	RGB projection	White, RGB
			Adjacent streets/areas	Not too bright to reduce required light level of special lighting		
		Smart	Activation of the scene	Timer control & calendar (planned scenes related to event calendar?)	t.b.d.	Timer control & calendar (planned scenes related to event calendar?)
			Deactivation of the scene	Timer control		Timer control
			Dynamics within the scene	n.a.	t.b.d.	n.a.
			Activation of the dynamics			
			Deactivation of dynamics			
			Data collection for system	t.b.d.		
			Data collection for learning	Presence and location of people, direction of people (north or south).		



Scenario SN3.7 Passing-by safely

Ensuring a feeling of safety on the entire square for commuters and people passing-by at all times of the day and night.

With good, functional lighting that ensures good visibility and highlights the commuting zone, reacting to the presence of people.



Scenario SN3.7 Passing-by safely						
Use case		Description	Ensuring a feeling of safety on the entire square for commuters and people passing-by at all times of the day and night. With good, functional lighting that ensures good visibility and highlights the commuting zone, reacting to the presence of people.			
		Timing	Early morning (everyday)	Night (everyday)		
		People	Commuters (on bike or foot)	Occasional cyclist or pedestrian		
		Activity	Passing-by (specially at Apostelstraat)	Passing-by		
		Desired state of users	Safe and efficient	Safe		
		Goal of the solution	Good, functional lighting			
		Function of lighting	Functional lighting levels	Good visibility on route, homogeneity to create sense of safety		
		Function of 'smart'	n.a.	Presence detection to light up the route		
Requirements system		Lighting	Type of lights	General lighting		
			Scenes	Static: highlighting the commuting zone at P4 level	Reactive: deeply dimmed, with 'highlighted' commuting zone based on presence	
			Light level	P4	P7 Minimal lighting level, with good visibility on axes (so the rest can be dimmed more)	
			Colour	White		
			Adjacent streets/areas	Ensure low contrast (similar lighting levels)		
		Smart	Activation of the scene	Timer control & calendar (working days)	Timer control & calendar (to differentiate between days of the week)	
			Deactivation of the scene	Timer control	Timer control (activating the early morning scenario)	
			Dynamics within the scene	n.a.	Highlighting the commuting zone	
			Activation of the dynamics		Presence detection	
			Deactivation of dynamics		Timer or absence of people	
			Data collection for system	n.a.	Presence of people	
			Data collection for learning	Amount and position of people (walking and cycling)		



Use case Liberty Square in Thurles, Tipperary

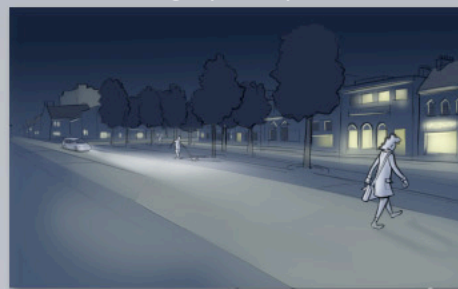
TT2.1 Commuting safely



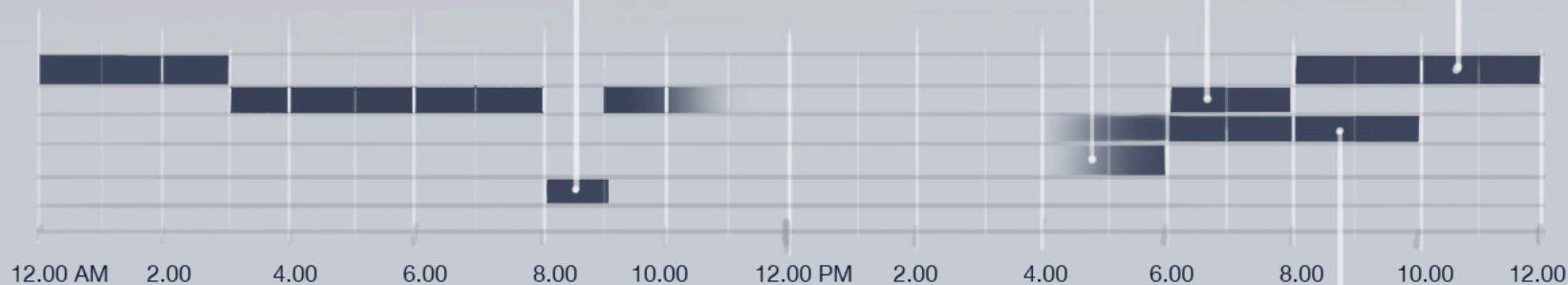
TT2.2 Enhanced shopping experience



TT2.3 Passing-by safely



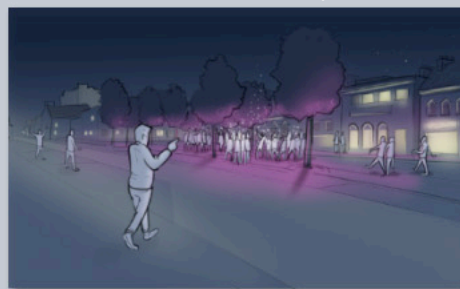
TT2.5 Enhanced nightlife experience



TT2.6 Christmas experience



TT2.7 Enhanced event experiences



TT2.4 Providing identity and orientation



Supporting event experiences on Liberty Square and connections in Thurles

Need

People indicate the opportunity to support local activities with adaptive, coloured lighting and connect these games, concerts, movies and parties better to the city centre to make it more lively.

Use case

The total storyboard of the interactive use consists of 7 scenarios that reflect different use by different target groups, related by timing over the day and night. The aim is to dim the light as much as possible, while creating a nice and fitting atmosphere.

Scenario TT2.1 Commuting safely

Providing good visibility for the flows of commuters (schoolchildren arriving by car and bus, through-traffic and delivery drivers for shops and bars) to avoid accidents. With bright spots nudging people to use pedestrian crossings and pass safely with multiple lighting scenes adapting to different weather conditions.



Scenario TT2.1 Commuting safely			
Use case		Description	Providing good visibility for the flows of commuters (schoolchildren arriving by car and bus, through-traffic and delivery drivers for shops and bars) to avoid accidents. With bright spots nudging people to use pedestrian crossings and pass safely with multiple lighting scenes adapting to different weather conditions.
		Timing	Between 8:00 and 9:15 am and between 4:00 and 6:00 pm on schooldays
		People	Children, parents dropping children off/picking them up, bus drivers, delivery truck drivers
		Activity	Passing through or dropping off/picking up
		Desired state of users	Safe and efficient
		Goal of the solution	Avoiding accidents ("Keep the kids alive")
		Function of lighting	Good functional lighting on the road and footpath Lighting to nudge people to use the official crossings and increase attention for pedestrians
		Function of 'smart'	n.a.
Requirements system	Lighting	Type of lights	Public lighting directed to the road and footpath Additional lighting for pedestrian crossings (playful?)
		Scenes	Active with multiple scenes ensuring good lighting adapted to all weather conditions
		Light level	Bright lighting level Very bright to ensure visibility in bright lighting levels
		Colour	White tbd
		Adjacent streets/areas	Ensure low contrast (similar lighting levels)
	Smart	Activation of the scene	Timer control & calendar (school days) in dark periods All day - all year
		Deactivation of the scene	Sunrise
		Dynamics within the scene	n.a.
		Activation of the dynamics	
		Deactivation of dynamics	
		Data collection for system	Finding a way to assess the visibility in different weather conditions (e.g. fog sensors, low sunlight)
		Data collection for learning	Amount of people, flow/ routes (where they cross), the number of (near) accidents



Scenario TT2.2 Enhanced shopping experience

Creating a warm atmosphere to attract more people in the afternoon and keep them longer in the area. With an uniform horizontal lighting scene at low intensity to emphasise the lighting of the shops and facades.

Scenario TT2.2 Enhanced shopping experience		
Use case		Description
		Creating a warm atmosphere to attract more people in the afternoon and keep them longer in the area. With an uniform horizontal lighting scene at low intensity to emphasise the lighting of the shops and facades.
		Timing
		Sunset to 6:00 pm (every day)
		People
		Shoppers
		Activity
		Shopping and enjoying the centre
Requirements system	Lighting	Desired state of users
		Extra experience to compete with online shopping
		Goal of the solution
		Creating an attractive atmosphere that makes people stay longer
		Function of lighting
		Creating a warm atmosphere at the footpath
		Function of 'smart'
		n.a.
Requirements system	Lighting	Type of lights
		Public lighting directed to footpath
		Scenes
		Static
		Light level
	Smart	Adapt the public lighting to the available lighting (emitted by shop windows and façade lighting)
		Colour
		tbd
		Adjacent streets/areas
		Ensure low contrast (similar lighting levels), and public lighting directed to the road not too bright.
		Activation of the scene
		Light sensor (sunset)
		Deactivation of the scene
		Timer control
		Dynamics within the scene
		Activation of the dynamics
		n.a.
		Deactivation of dynamics
		Data collection for system
		Light levels of the shop windows and facades
		Data collection for learning
		Amount of people

Scenario TT2.3 Passing-by safely

Providing a good overview of the area to let people pass-by safely.
With a well-designed, static lighting scene at low intensity.



Scenario TT2.3 Passing-by safely		
Use case		Description
		Providing a good overview of the area to let people pass-by safely. With a well-designed, static lighting scene at low intensity.
		Timing
		Every day from 6:00 pm (or sunset if that is later) to sunrise, unless other scenarios are active
		People
		Everybody
		Activity
		Passing-by
		Desired state of users
		Safe
		Goal of the solution
		Good functional lighting
		Function of lighting
		Creating good visibility with minimum light levels
		Function of 'smart'
		n.a.
Requirements system	Lighting	Type of lights
		All public lighting
		Scenes
		Static
		Light level
		Minimum lighting level with high homogeneity
		Colour
		(Cool) White
		Adjacent streets/areas
		Ensure low contrast (similar lighting levels)
	Smart	Activation of the scene
		Timer control
		Deactivation of the scene
		Timer control
		Dynamics within the scene
		Activation of the dynamics
		n.a.
		Deactivation of dynamics
		Data collection for system
		n.a.
		Data collection for learning
		Amount of people

Scenario TT2.4 Providing identity and orientation

Creating landmarks around the city to emphasize the Thurles identity and to provide orientation.

With facade lighting on the castles at the lowest possible level with sufficient contrast.



Scenario TT2.4 Providing identity and orientation		
Use case		Description
		Creating landmarks around the city to emphasize the Thurles identity and to provide orientation. With facade lighting on the castles at the lowest possible level with sufficient contrast.
		Timing
		Sunset to 10:00 pm (every day)
		People
		Everybody
		Activity
		Orientating
Requirements system	Lighting	Desired state of users
		Enhanced experience
		Goal of the solution
		Creating enhanced atmosphere and orientation means for residents and visitors
		Function of lighting
		Facade lighting on castles to create a pleasant atmosphere and provide identity
		Function of 'smart'
		n.a.
	Lighting	Type of lights
		Facade lighting (out of project scope)
		Scenes
		Active: multiple scenes to dim during evening and night and to adapt to seasons
		Light level
	Smart	Sufficient but as low as possible
		Colour
		tbd
		Adjacent streets/areas
		Dimmed to be able to see the landmarks lighting up
		Activation of the scene
		Timer control (& calendar days for seasonal effects?)
		Deactivation of the scene
		Timer control
		Dynamics within the scene
		Activation of the dynamics
		n.a.
		Deactivation of dynamics
		Data collection for system
		n.a.
		Data collection for learning
		n.a.

Scenario TT2.5 Enhanced nightlife experience

Creating a pleasant atmosphere during pub hours to make the area lively and enhance the safety of pedestrians, e.g. while moving between places, being picked up or grabbing a cab. With multiple lighting scenes that change over the night reacting to the private lighting and ensure overall low light levels to be able to create slightly brighter pick up points for people heading home.



Scenario TT2.5 Enhanced nightlife experience					
Use case		Description	Creating a pleasant atmosphere during pub hours to make the area lively and enhance the safety of pedestrians, e.g. while moving between places, being picked up or grabbing a cab.With multiple lighting scenes that change over the night reacting to the private lighting and ensure overall low light levels to be able to create slighting brighter pick up points for people heading home.		
		Timing	Thursdays to Sundays 8:00 pm to midnight		
		People	Everybody		
		Activity	Going to the pubs		
		Desired state of users	Extra experience and safety for people heading home		
		Goal of the solution	Creating an attractive atmosphere and safe area to walk around		
		Function of lighting	Creating a warm atmosphere at the footpath and terraces and create a slightly brighter pick-up point for people heading home.		
		Function of 'smart'	Adapt the public lighting to the available lighting (emitted by pubs and facades)	n.a.	
		Requirements system		Lighting	Type of lights
Scenes	Active with multiple scenes and multiple areas				tbd
Light level	Adjusted to the private lighting to create an overall pleasant atmosphere, but not too bright to reduce the required lighting level of decorative lighting and pick-up 'spots'				
Colour	tbd				
Adjacent streets/areas	Dimmed to emphasize the footpath as brightest area, also lights directed to the road are dimmed				
Smart	Activation of the scene			Timer control, calendar	
	Deactivation of the scene			Timer control	
	Dynamics within the scene			Adjusting to changing light emitted by pubs (to balance light levels of public and private lighting)	
	Activation of the dynamics			tbd (e.g. timer control when agreed with pub owners or light sensor for automatic adjustment)	
	Deactivation of dynamics			tbd	
	Data collection for system			Light levels of the pubs and facades	
	Data collection for learning			Amount of people	



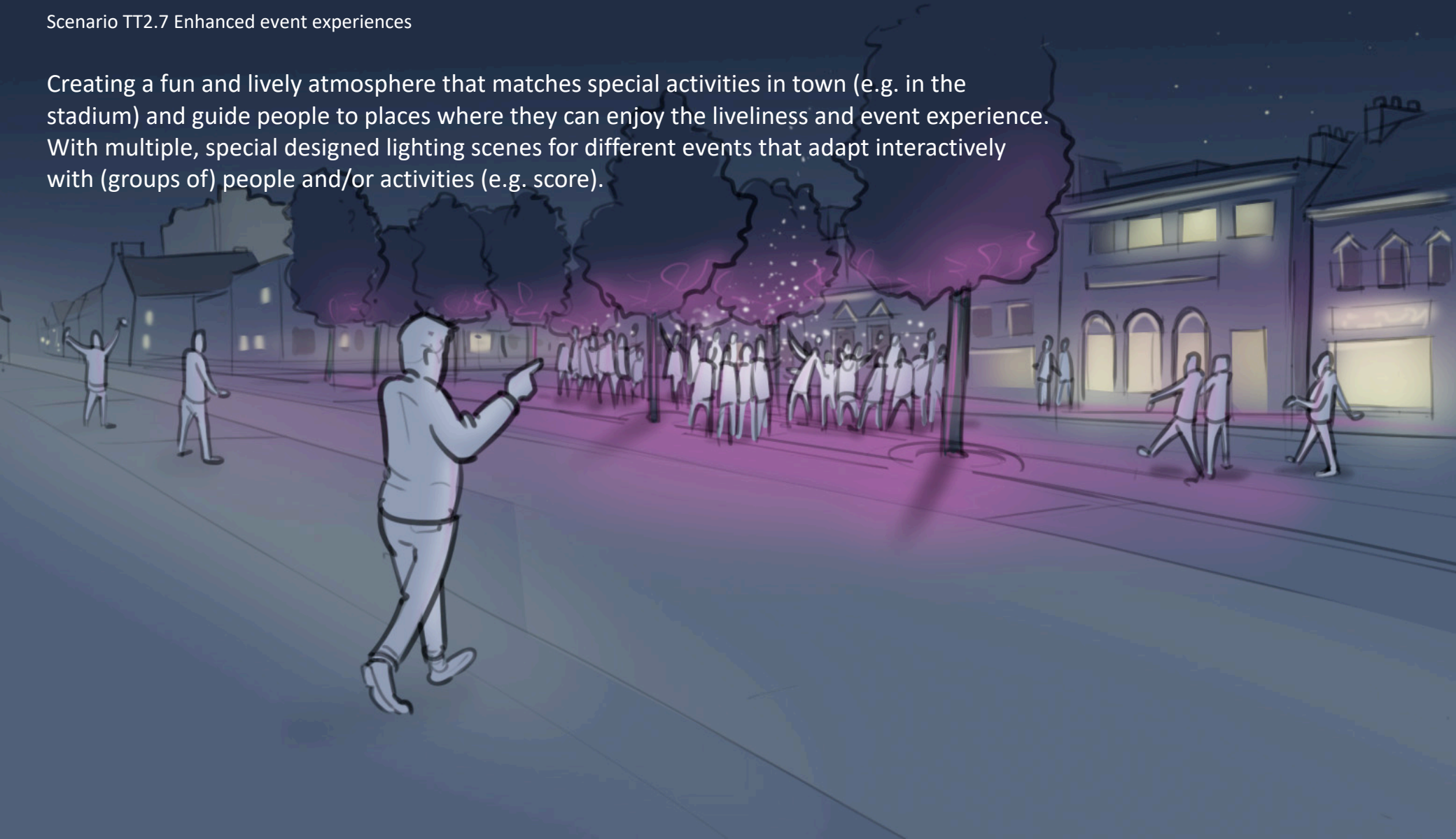
Scenario TT2.6 Christmas experience

Creating a fabulous Christmas experience with multiple scenes to change over time to keep it interesting for the entire Christmas season.

Scenario TT2.6 Christmas experience			
Use case		Description	Creating a fabulous Christmas experience with multiple scenes to change over time to keep it interesting for the entire Christmas season.
		Timing	1 Dec - 15 Jan between 3:00 pm and 2:00 am
		People	Everybody
		Activity	Passing-by or staying in the area
		Desired state of users	Exited
		Goal of the solution	Creating an enhanced atmosphere
		Function of lighting	Creating a special Christmas feeling
		Function of 'smart'	n.a.
Requirements system	Lighting	Type of lights	Projection or special lighting elements
		Scenes	Active with multiple scenes (e.g. one per evening) to keep it interesting for a longer period
		Light level	Bright to emphasize the effect
		Colour	RGB
		Adjacent streets/areas	Dimmed to emphasize the special lights
	Smart	Activation of the scene	Timer control, calendar
		Deactivation of the scene	Timer control
		Dynamics within the scene	n.a.
		Activation of the dynamics	
		Deactivation of dynamics	
		Data collection for system	n.a.
		Data collection for learning	Appreciation of the different scenes, amount of visitors

Scenario TT2.7 Enhanced event experiences

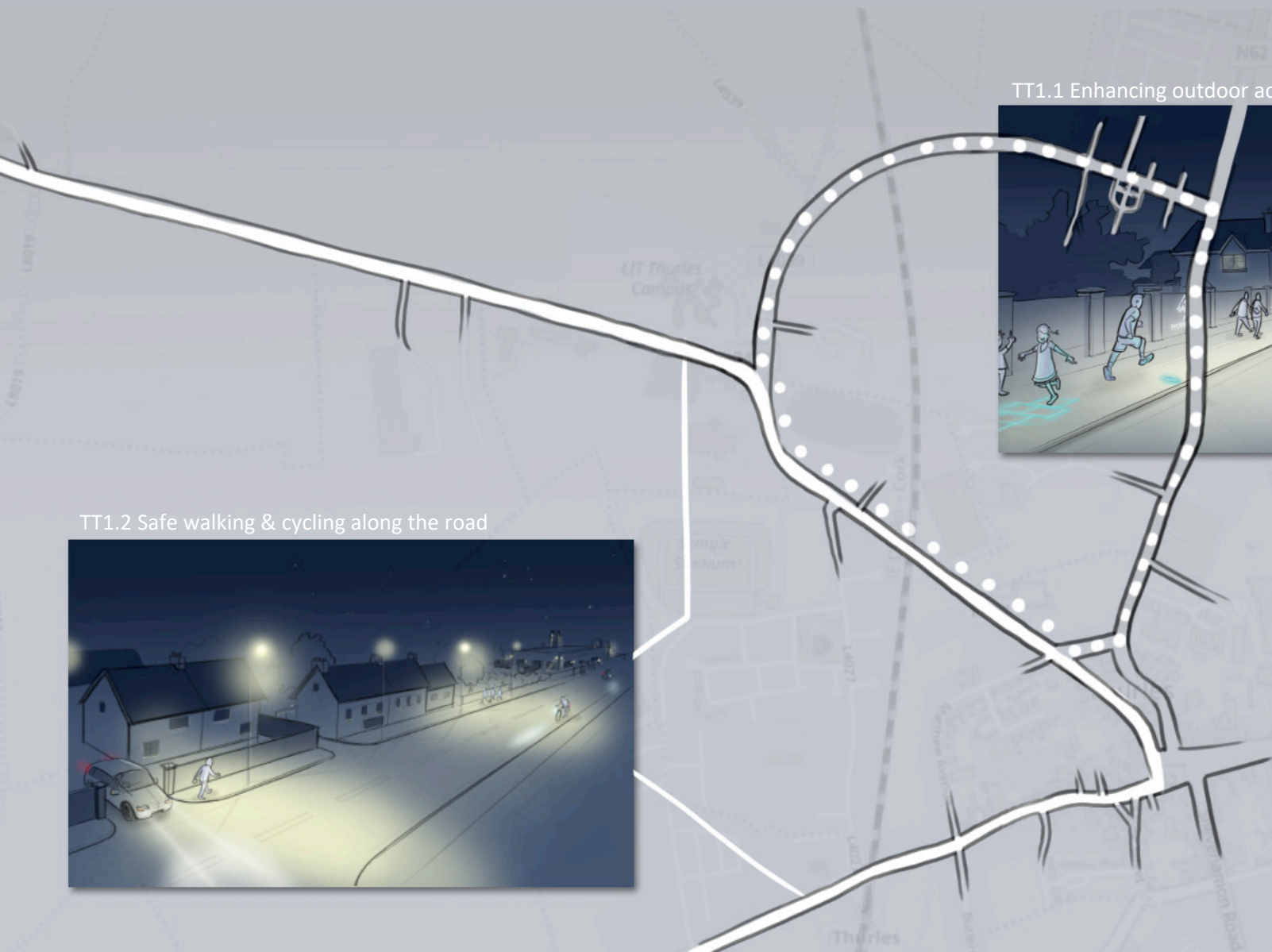
Creating a fun and lively atmosphere that matches special activities in town (e.g. in the stadium) and guide people to places where they can enjoy the liveliness and event experience. With multiple, special designed lighting scenes for different events that adapt interactively with (groups of) people and/or activities (e.g. score).



Scenario TT2.7 Enhanced event experiences							
Use case		Description	Creating a fun and lively atmosphere that matches special activities in town (e.g. in the stadium) and guide people to places where they can enjoy the liveliness and event experience.				
			With multiple, special designed lighting scenes for different events that adapt interactively with (groups of) people and/or activities (e.g. score).				
		Timing	afternoon, evening and night, all year round when an event is happening				
		People	Event visitors and residents				
		Activity	Enjoying the liveliness of special activities in town				
		Desired state of users	Enhanced experience				
		Goal of the solution	Creating a matching atmosphere related to the event and guiding people to the event or Liberty Square				
		Function of lighting	Creating a matching atmosphere		Guiding people		
Function of 'smart'		Enabling people to create scenario and municipality (or event coordinator) to make selection		Guiding the flow of people			
Requirements system		Lighting	Type of lights	Lights on footpaths	Projection or special lighting elements	Spectacular light effect using the public lights along the route	
			Scenes	Reactive: multiple scenes (special design per event) reacting to events (e.g. goal)			Interactive: reacting to (groups of) people
			Light level	Sufficient to enable visibility of the effect			
			Colour	RGB			White
			Adjacent streets/areas	Dimmed to emphasize the special lights and special effects			
		Smart	Activation of the scene	Timer control & event calendar			
			Deactivation of the scene	Timer control & event calendar			
			Dynamics within the scene	tbd			tbd (spectacular effect)
			Activation of the dynamics	tbd			tbd
			Deactivation of dynamics	tbd			tbd
Data collection for system	n.a.			Presense, location and direction of people			
Data collection for learning	Amount of people on square and appreciation of the scenes			Appreciation by visitors and residents			



Use case TT1 R498 & R660 Thurles, Tipperary



TT1.1 Enhancing outdoor activities



TT1.2 Safe walking & cycling along the road



Safe cycling and walking along mixed traffic roads R498 and R660 in Thurles

Need

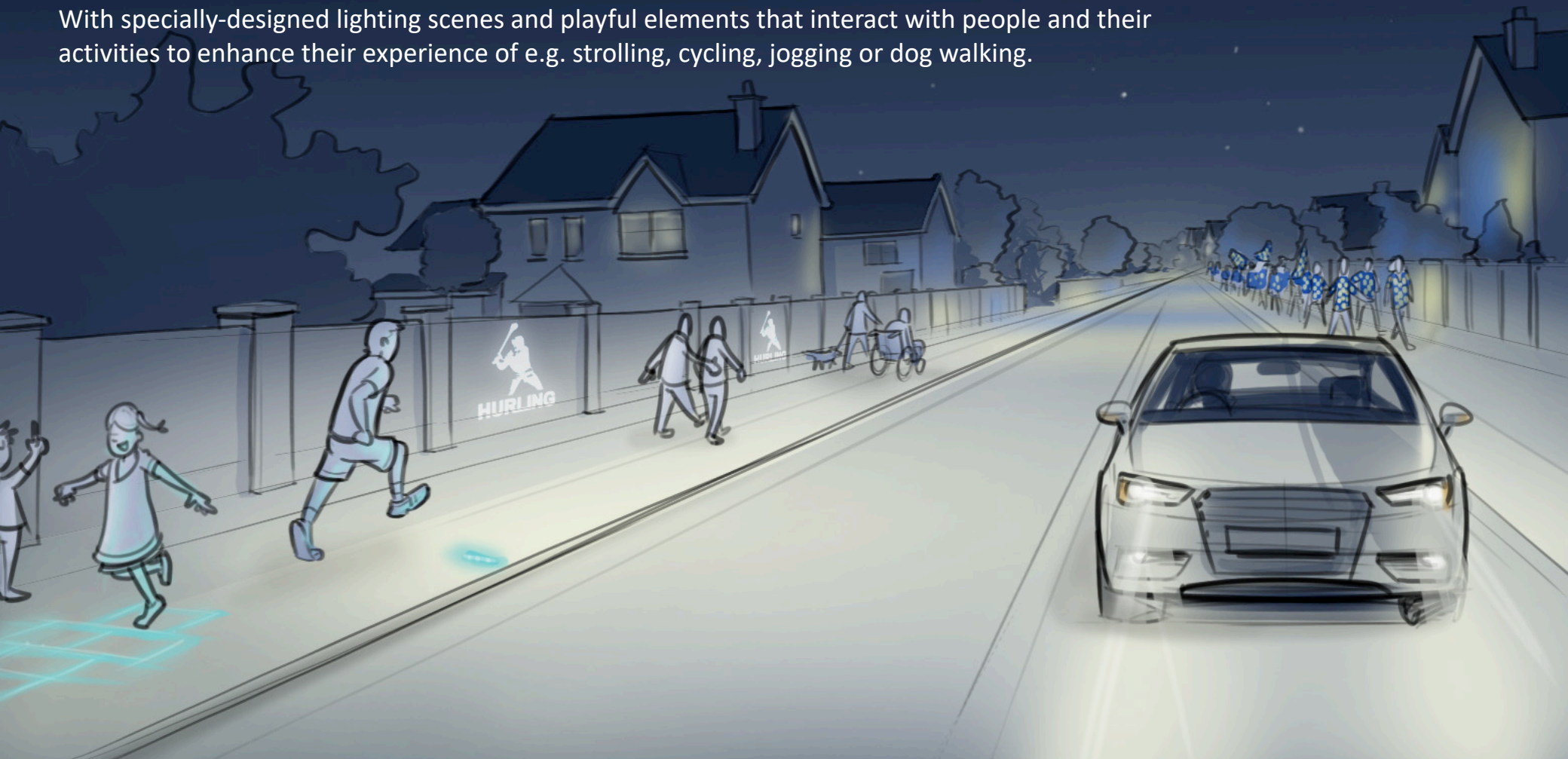
People indicate the need for safe cycling and walking along the mixed traffic roads, where the lighting should be aimed at pedestrians, to identify and highlight them and to warn and nudge the car drivers on the main road.

Use case

The storyboard of the interactive use consists of 2 scenarios. One aiming for the safety while walking and cycling along the road, the other enhancing the experience of being active at night at the Jimmy Doyle Loop.

Scenario TT1.1 Enhancing outdoor activities

Creating a fun and interactive area to make it attractive for all residents, including families with children, disabled and people with impaired vision to spend time outside and be physically active. With specially-designed lighting scenes and playful elements that interact with people and their activities to enhance their experience of e.g. strolling, cycling, jogging or dog walking.

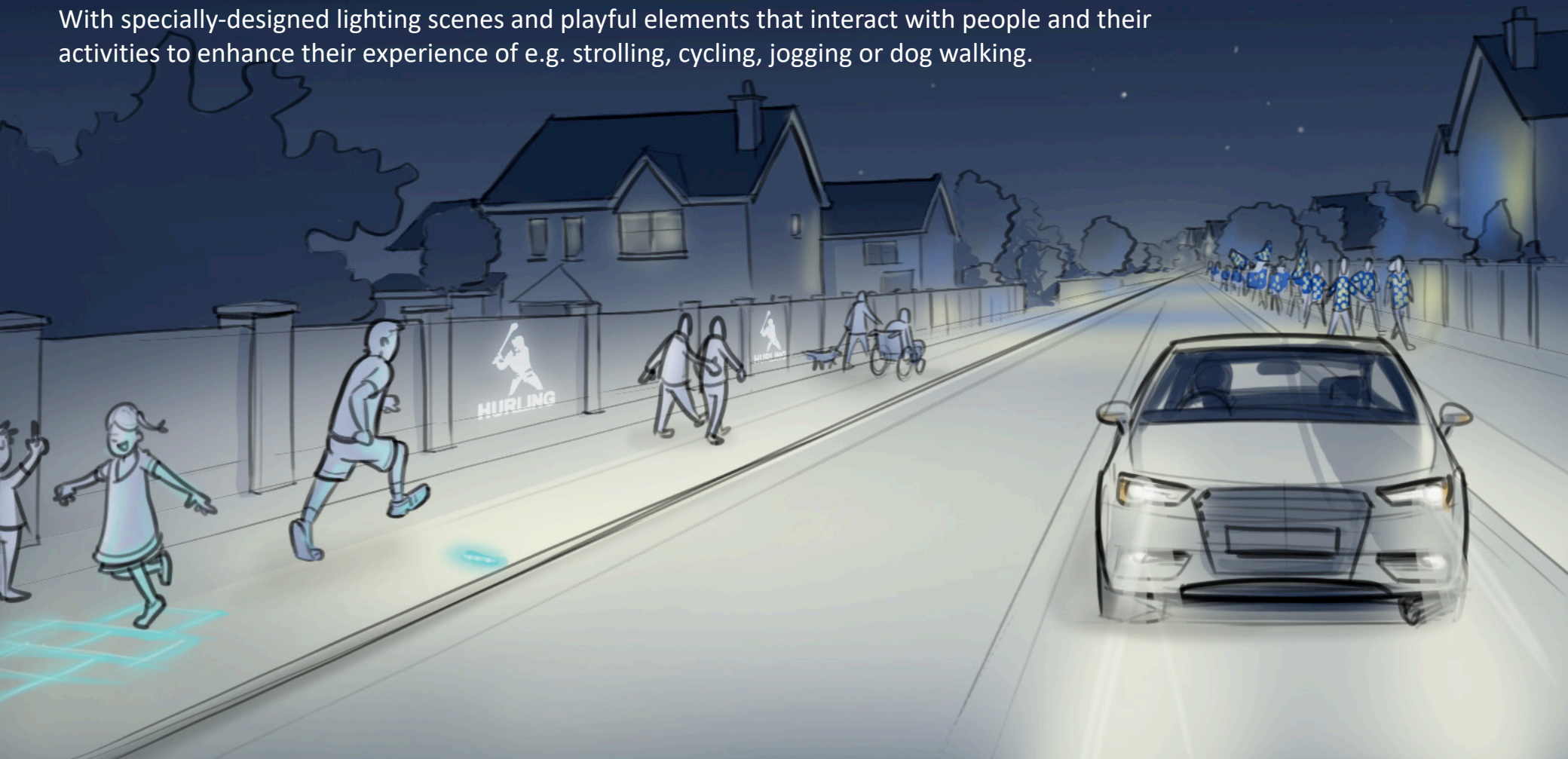


Scenario TT1.1 Enhancing outdoor activities (1 of 2)

Use case		Description	Creating a fun and interactive area to make it attractive for all residents, including families with children, disabled and people with impaired vision to spend time outside and be physically active. With specially-designed lighting scenes and playful elements that interact with people and their activities to enhance their experience of e.g. strolling, cycling, jogging or dog walking.					
		Timing	Always	6:00pm-10:00pm	6:00pm-8:00pm	Events in the evening	Early morning	Dusk till early morning
		People	Athletes & disabled	Residents - incl. families with kids and disabled		Visitors	Everybody	
		Activity	Running / training / wheelchair exercise	Strolling	Interactive play	Visiting event in the stadium (e.g. Hurley matches or concerts)	Mixed use	
		Desired state of users	Improve performance	Having fun			Comfortable and safe	
		Goal of the solution	Evoke people to be active outside and improve their performance	Evoke people to be physically active by presenting local cultural content and games for children		Creating a matching atmosphere related to the event	Good functional lighting	Create a warm and pleasant atmosphere with low light levels
		Function of lighting	Enabling a better training with interactive lighting	Enhanced atmosphere with (interactive) lighting elements		Making visitors feel welcome	Functional lighting levels for safe commuting	Contribute to the atmosphere
		Function of 'smart'	Gaming element for individual athletes	tbd (e.g. additional sound effects for visually impaired)	Gaming elements for kids	n.a.	n.a.	
Requirements system	Lighting	Type of lights	Special lighting element	Projection	Special lighting element and/or projection	Projection and/or special lighting elements	General public lighting	
		Scenes	Interactive with multiple users	Active: multiple scenes that are changing over time, to keep it interesting	tbd, changing over time to keep it interesting	Active: multiple scenes related to the events	Active: with multiple scenes	
		Light level	Sufficiently bright to be clearly visible (also during the daylight?)				Normal light level	Low levels to ensure clear visibility of special lighting
		Colour	RGB	tbd	tbd	tbd	White (cool?)	White (warm?)
		Adjacent streets/areas	Low levels to ensure clear visibility of special lighting	n.a.	n.a.	n.a.	n.a.	n.a.
		- to be continued on next page -						

Scenario TT1.1 Enhancing outdoor activities

Creating a fun and interactive area to make it attractive for all residents, including families with children, disabled and people with impaired vision to spend time outside and be physically active. With specially-designed lighting scenes and playful elements that interact with people and their activities to enhance their experience of e.g. strolling, cycling, jogging or dog walking.



Scenario TT1.1 Enhancing outdoor activities (2 of 2)								
Requirements system	Smart	Activation of the scene	tbd	Timer control		Timer control & event calendar	Timer control - every day	Dusk sensor
		Deactivation of the scene	tbd	Timer control		Timer control & event calendar	Dawn sensor	Timer control
		Dynamics within the scene	Multiple users can run together or alone to improve their performance (e.g. against a virtual performance pacer)	n.a.	tbd	tbd (e.g. colours adjusting to the winning team)	n.a.	Dim scenarios over evening and night
		Activation of the dynamics	Activation by a user (e.g. through a smart phone app)		tbd	tbd		Timer control
		Deactivation of dynamics	Logging of by the user		tbd	tbd		Timer control
		Data collection for system	Position, speed, direction, user identity, user performance profile	tbd (depending on the interaction with the playing element)		tbd	Initial measurement of the road use, to select the desired timeslots for dim scenarios	
		Data collection for learning	Amount of people that install the app, amount of users, frequency of use, user satisfaction	Amount of people strolling along during the year	Amount of children using it, the frequency of use, user satisfaction	Amount of people passing, appreciation of the experience	Amount of people present, perception of comfort	

Scenario TT1.2 Safe walking & cycling along the road

Providing good visibility of cyclists and pedestrians alongside the mixed traffic road to increase their safety. With local adaption of the lighting to create brighter areas around pedestrians and cyclists.



Scenario TT1.2 Safe walking & cycling along the road					
Use case		Description	Providing good visibility of cyclists and pedestrians alongside the mixed traffic road to increase their safety. With local adaption of the lighting to create brighter areas around pedestrians and cyclists.		
		Timing	Dusk till xx pm and yy am till dawn	xx pm till yy am	
		People	All road users		
		Activity	Walking and cycling commuters and schoolchildren		
		Desired state of users	Feeling safe		
		Goal of the solution	Enable maximum dimming on roads with mixed traffic by increasing the visibility of pedestrians and cyclists		
		Function of lighting	Making car drivers aware of cyclists and pedestrians alongside the road		
		Function of 'smart'	n.a.	Detecting and highlighting presence of cyclists and pedestrians	
Requirements system		Lighting	Type of lights	Public lighting	
			Scenes	Active: with multiple scenes	Interactive
			Light level	Normal	
			Colour	White	
			Adjacent streets/areas	n.a.	
		Smart	Activation of the scene	Timer control - every day	
			Deactivation of the scene	Timer control - every day	
			Dynamics within the scene	Multiple scenes to dim during evening and night	Highlighting the area around pedestrians and cyclists
			Activation of the dynamics	Timer control	Presence of cyclists or pedestrians
			Deactivation of dynamics	Timer control	Absence of cyclists of pedestrians
			Data collection for system	Initial measurement of the road use, to select the desired timeslots for dim scenarios	Presence, speed and direction of cyclists or pedestrians. Number of false detections (outside the system)
			Data collection for learning	Number of cars, their speed and the number of accidents. Perception of safety and comfort of cyclists and pedestrians.	