Human Scale Lighting

The importance of the human scale in urban illumination – harnessing light as a social tool to frame perceptions, emotions and experiences.

Dornbirn, November 2016 – Light functions as a filter during the night, helping humans to experience the space around them. This filter operates between the individual and the reality of the night, shaping the way we perceive the world around us.

We are often faced with bright situations influenced by technological elements or economic considerations. Sometimes theories such as "the more the better" (often associated with ideas of safety[1]) dominate the scene, whilst other approaches focus on the ever-increasing problem of light pollution, leading to the illumination of urban areas using distorted lighting solutions and abnormal lighting effects. These often bear little or no relation to how people interact with the urban context and take little account of considerations such as history, character and, perhaps most importantly, the natural night-time condition: darkness. Perhaps it was better when torches lit up the streets and, as buildings sprang up all around, light truly responded to the needs of the city's inhabitants.

This could certainly still represent a feasible option. However, our perception of spaces (and their liveability) has evolved sufficiently for us to question how this "filter" should really work. We now think much more about just how we experience an environment, taking into account the myriad of factors that coexist and interact with humans in the nocturnal ecosystem – and which vary depending on factors such as geographical position and the level of human settlement.

However, the goal of this article is not to identify a specific methodology for designing light in towns and cities, but rather to evaluate how we can use light as a "filter" to support the key values of wellbeing, human interaction and social identity in urban environments. These kinds of lighting solutions should inevitably shape the transition from day to night, and with it the perception and behaviour of the central figure of this story: the individual.

Figure 1 | Rhodes old town

1. CITIES

We naturally have to start with the context in which we find ourselves. Currently more than half the world's population live in urban areas. By 2050 this percentage is expected to rise to around 75%. The growing demand for living spaces within cities, their renovation and their planning – together with the emergence of various new activities related to the movement of people, innovative transport systems and advanced communications infrastructure – mean that the modern city is truly a 24-hour place. In this way, the five elements of the urban structure defined by Kevin Lynch in "The image of the city" (paths, edges, districts, nodes and landmarks) assume increasing importance within society, especially at night. This also means that the "imageability"[2] and "way-finding"[3] characteristics of an urban space assume even greater value when darkness falls.

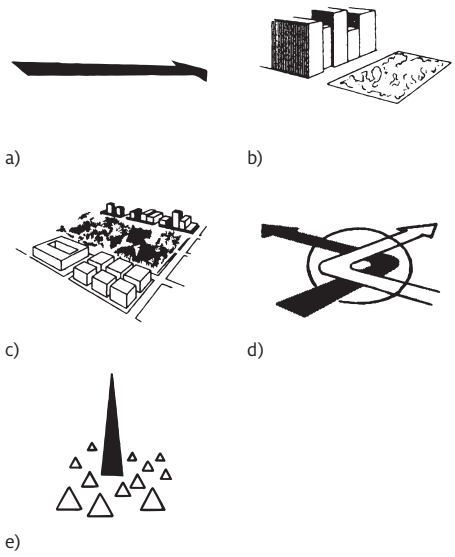


Figure 2 | Lynch, Kevin, The Image of the City, five line drawings, © 1960 Massachusetts Institute of Technology, by permission of The MIT Press.
Kevin Lynch's five elements of the urban structure. a) path, b) edges, c) districts, d) nodes, e) landmarks

Many of the most prominent architecture and urban planning firms promote new theories on the development of cities and support the latest trends in urban transformation – from the conversion and alternative usage of industrial buildings to the way that new satellite towns are designed. There is also a way of classifying cities within a single global vision (as a kind of "city branding"), depending on the particular economic, social, technological and historical focus.

Today we hear about resilient cities, tactical cities, smart cities, competitive cities, innovative cities, mixed-use cities and local-global cities, to name but a few of the titles given to modern metropolitan areas. The variety of characteristics that a city can assume is essentially linked to the types of activities on offer. These classifications, identifications and trends are therefore closely linked to people and what they do in certain environments. For example, a strong showing in the fields of economic development, tourism, technology and connectivity often shape the identity of certain urban areas.

This now means that more and more of the economic exchanges and social life in a city also take place at night. The idea that a city is awake 24 hours a day softens the transition between day and night. This shift tends to be lost if the activity in some way straddles this transitional process or if a certain action, which used to mostly be seen in the morning, can now be carried out at night.

The general absence of seamless solutions over the course of 24 hours, in terms of human behaviour or activities that take place in an urban space, leads us to analyse night-time in a completely new way. The identification of human actions or specific night periods can help us to intelligently and effectively analyse the current needs of people during the night-time hours.

Figure 3 | People playing basketball during dusk hours

2. PEOPLE

"We must consider not just the city as a thing in itself, but the city being perceived by its inhabitants," explains Kevin Lynch in "The image of the city". He goes on to say that "[...] The urban landscape, among its many roles, is also something to be seen, to be remembered and to delight in."
Plans for urban spaces and urban lighting should not be exclusively focused on human beings. Indeed, the overriding natural ecosystem (that revolves around human beings and yet is quite clearly composed of many other factors, such as animals, plants and climate) should always play a prominent role. Nevertheless, we will now focus on how people perceive the external environment. This will help us to accurately understand the issue of light at night, depending on the psychological perceptions that characterise certain types of urban environment.
As Daniel Berlyne argued, people are constantly looking for knowledge

from the real world. The additional information a person can get very often depends on the level of uniqueness displayed by the subject that is being observed. Colin Ellard, who once again references Berlyne, explains this theory:
“One of the keys to the theory is that to quantify information, one must be able to estimate the probability of occurrence of individual elements in the message. Elements that don’t occur very often provide more information than those that occur commonly. Adding up all of the elements in the whole message can provide a number in bits that describes in bare formalities the information content of the message. To make this concrete, consider an example. Imagine that you retrieve a message from your voicemail. The message is quite garbled, but you can make out certain words. If you heard a message like "...the...to... and...you..." then you would learn very little that was new. The bit value of the utterance would be close to zero. On the other hand, if you heard "I’m...way...dinner...call...later" you could probably do a pretty good job of disentangling at least a part of the meaning of the message. In terms of information theory, both of the utterances contain the same number of words. The difference is that the first message contains only words that appear with very high frequency in English; they carry very few bits of information. The second message, in contrast, contains words with lower frequencies (and so lower probabilities of occurrence), so there is more information available.”[5]
If we imagine that the complete phrase (using the example from above) is the daytime situation at our location, we should now try to understand how important it is to work with light at night to help us highlight the right “bits of information” to improve the way the stage is communicated to its players. This theory can be applied to both façade illumination and the design of a lighting layout for a street or square.

The psychological aspect is only one of several factors that influence human perception of the surrounding environment at night. However, it is important to understand how an accurate reading of the environment itself can affect wellbeing, orientation and the sense of safety, along with the related emotions stimulated by these situations.
Jan Gehl, with regard to the relationship between people and the city, often talks about “inviting” individuals to act in a certain way.
This way of thinking is gaining increasing acceptance, with cities such as Copenhagen, New York and Melbourne already showing the first results of this approach. Gehl based his theory on the idea that by implementing elements that characterise a particular activity, people are invited to carry out the activity itself. Raising the number of roads is an invitation to use the car, which thereby increases the amount of motorised traffic, whilst building more bike paths should encourage more people to travel by bike. Yet the most interesting result obtained from Gehl's work concerns pedestrian areas. Improving these areas not only increases pedestrian traffic (which also has positive consequences in terms of health, safety and sustainability), but also strengthens and enhances city life.

a)

b)

Figure 4 | The typical lighting of an urban space (a) is generally focused on the horizontal plane. Referring back to Berlyne's theory, this can be likened to the first example phrase (Colin Ellard), because by highlighting very common elements, no real information is provided.
More vibrant lighting, with the accent on vertical surfaces, picks out the most valuable sources of information and creates an environment that has a richer social and psychological identity. (b)

This shows therefore how the psychological and emotional aspects, linked to the perception of locations and the qualitative level of wellbeing experienced there, can shape the activities taking place in an urban space. In addition, these factors can also help boost the social identity of specific locations.

3. A NEW ROLE FOR LIGHT OUTDOORS?

Ludovica Scarpa argues that: "[...] economic wellbeing in Europe and North America since World War II has been growing steadily, in contrast to the degree of satisfaction and psycho-physiological wellbeing. If you take the ability to try to "trust in others" as an indicator of individual safety, then safety has decreased. Society is becoming anonymous, in anonymous spaces that make anonymous people, where human contacts are random and occasional, so it is harder to develop trust. It is therefore worth researching the contribution that spaces make towards the current state of depression in society."[5]
As we outlined earlier, the psychological and behavioural characteristics of a man-made space change hand-in-hand with human needs and with the way an area is perceived, even at night. The aforementioned factors, however, are nothing more than components that shape everyday human experience in urban applications. As a result, the purpose of "touching on" the previous aspects could be to engage with and to improve the social value of the spaces themselves. Studies have shown that when people meet up with friends, talk with neighbours or interact confidently with strangers, they also tend to feel a strong sense of belonging to the places that host and stimulate this type of social activity.

A space devoid of human activity is a dead and depressed space that arouses little interest. This is likely to be negative in both economic and social terms. On the other hand, a place where there are different activities and interests can bring many benefits to an urban area. Activities can be varied and can of course take place at different times of day. Jan Gehl defines three macro-activities: necessary activities, optional activities and social activities.[6]
The information that people derive from the surrounding space depends on the planned scale of the environment and the range of related activities. For example, the context of the space shown in Figure 6 a) is designed primarily for people travelling by car. This means that the information needs to be understood quickly and from a distance whilst travelling at speed and with restricted visual focus. The context was therefore developed around the necessary activity, which in this case is the movement of people by car. The scale of use of this application is linked to the speed of 60 kilometres per hour that a car usually travels in this type of situation. In Figure 6 b) the space has been designed to a more human scale, in view of the fact that the people are only moving at 5 kilometres per hour. At this speed and with a wide

Figure 5 | Sägerbrücke in Dornbirn, Austria – In 2016 the old space has turned into a place with social identity thanks to a renovated architecture and a human scale lighting.

Before

After

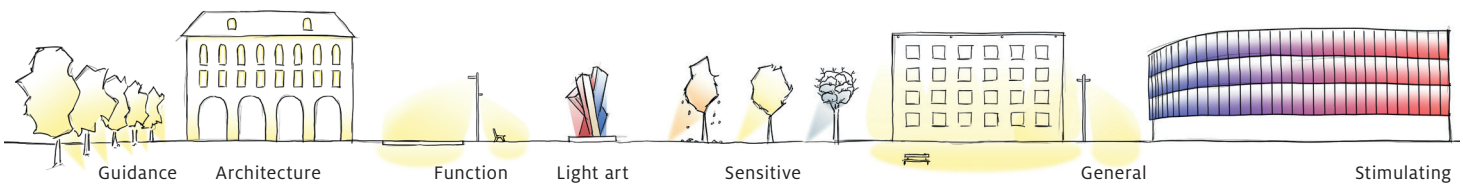
field of vision, people have time to get more information at close range. The necessary activity – moving from one point to another (e.g. from home to the office or from home to school) – can of course be supplemented by other optional activities like shopping or relaxing in a café.

Perception of the context is therefore critical to the establishment of human activities in a specific space. It would of course be impossible to drive a car along the street in Figure 6 b) at high speed because we could not cope with the amount of information coming into our field of vision.
However, if we extend this concept into the night, some questions begin to arise. Why is the lighting philosophy used for some types of context, like that of Figure 6 a) – with its own functional requirements and business activities – also often applied to Figure 6 b), where both the psychological orientation and the needs of the users are completely different? Why do we not think – through the use of light – about increasing the number of human activities in location Figure 6 b), or about creating a social identity to revitalise urban environments at night and to adjust the lighting of an outdoor space to more accurately reflect the human scale?

As it is generally agreed that the lighting of outdoor spaces no longer needs to simply reflect functional aspects or comply with regulations, it is now possible to consider using the "light filter" as if it were part of the built environment and to utilise this element in the same way as theatrical lighting. If we think about an urban space as a theatrical stage, by changing or replacing the filter (or filters) we can create different lighting scenarios to meet varied human requirements that occur at different times of night. Thanks to these considerations and progressive technological development, we are now able to further develop the hypothesis of a lighting approach for urban areas based on specific levels (or layers) of light. In the same way that CAD programmes enable us to switch different layers of a drawing on or off, depending on the information that we want to find or display, it should be possible to manage light scenes (by activating or deactivating various layers of light) in an urban environment, in line with human activity and the particular time of day or night.
Figure 7 shows an example of how the same urban environment can play host to different human activities or be associated with

Figure 6 a) | Yaowarat road, Bangkok | Thailand

Figure 6 b) | Caen, Normandy | France



requirements that characterise the various periods of the night. In Figure 7 a), in the early evening, there is a greater need to experience the park in front of the station, which in turn helps define the environment as a point of spatial reference – a guiding landmark. In Figure 7 b), in the middle of the night, the feeling of safety and respect for the ecosystem need to be taken into account. If you consider darkness to be a natural starting point, you may look to combine adaptive functional lighting with an appropriate level of vertical illuminance. In this case both human behaviour and the nocturnal ecosystem are important factors. As several studies have shown, artificial light can influence photo-sensitive animals and affect the procreation of plants by distracting pollinators. Rogier Narboni has for many years talked about "dark infrastructure" as an additional layer for lighting master plans.[7] He firmly believes in darkness as a fundamental element of the night, not only for sustainable purposes but also to help people redefine their perception of urban atmospheres and strengthen the triangular connection between people, nature and city. Introducing specific dark elements and dark areas can also serve to preserve the identity of a particular place. In Figure 7 c), in the early morning, the layer dedicated to guiding commuters is predominant, but having a stimulating scenario may also be important, helping to increase the level of social interaction in "non-places" [8] like train stations.

Figure 7 a) | Early evening

Figure 7 b) | Night

Figure 7 c) | Early morning

4. THE ACTIVE "FILTER" OF LIGHT

As we look to the future, active light is needed to take a step forward, especially when we reflect on the gradual change that is shaping cities, society and human behaviour. The challenge is to adapt something that could well be considered an element of the built environment – artificial light – to reflect human dynamics and the morphological characteristics of the space around us.

The activities associated with an urban space play a key role in defining the level of wellbeing. We will be able to illuminate spaces more to a human scale by adapting the light to meet various needs and by using it in a bespoke way in terms of timing and design.
The concept of active light can be seen in many ways and can help us clearly understand the strength of the bond between the lighting of the space and the people that actually use the space. We can almost view light like a changing organism that is closely related to man and his emotional sphere, capable of filtering the reality that surrounds us and thereby influencing the way we experience and perceive our immediate environment.

The variation in colour temperature within a defined time span affects the amount of melatonin produced by the human body, which in turn impacts directly on our biological status. The dynamism, intensity and colour of light can combine to stimulate a vast array of emotions. Certain design approaches also involve a psychological aspect.

This is of fundamental importance to facilitate certain activities, behaviours and social interactions.

In addition, active light[9] should not just reflect human activities, but also the interaction with the natural ecosystem, limiting the impact of artificial light on plant and animal species and reducing the consumption of energy resources.

This concept is at the heart of the Zumtobel commitment to develop a dedicated product portfolio for the illumination of outdoor environments. With a constant eye on innovative technologies and material quality, the goal is to provide designers with a toolbox of lighting instruments that lets them devise solutions to a human scale, in all sizes and concepts. This means that public spaces can be turned into places with a specific identity, raising the quality of life in urban environments that have been designed by people – and thereby transforming them into urban environments that are designed for people.

Dario Maccheroni
Lighting Application Manager
Zumtobel Lighting GmbH

ZUMTOBEL

Human Scale Lighting

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[1] LSE and configuring light from “Tackling social inequalities in public lighting”: “Lighting plays a prominent role in determining what kinds of inequalities are reproduced, particularly in the public realm and in the context of housing. London’s social housing estates can be immediately recognised by their lighting: overly bright and cold light from tall masts, calibrated for maximum visibility and minimal atmosphere and implemented to allow for better CCTV surveillance and the prevention of anti-social behaviour and crime. This kind of lighting marks these spaces out as intrinsically problematic, as threatening and risky. It also conBilds them as less-valued spaces for less-valued people, to be dealt with functionally and at the expense of massive light pollution and cost in energy and maintenance. In fact, darkness has become a luxury good in London: only in more affluent neighbourhoods, heritage or tourism-oriented areas and high-priced ‘designerly’ developments does lighting become part of carefully curated and aesthetically pleasurable nightscapes. This shows how lighting can both reflect and reproduce fundamental inequalities via the ‘framing’ of different urban places and populations, and how their material environment is actually designed and constructed: there is a fundamental division between technical and aesthetic ways of framing urban spaces. Lighting is either deployed to enhance social value through place-making (emphasising heritage, identity and aesthetics) or as a low-cost engineering solution to technical problems of order, safety and policing.”

[2] Kevin Lynch on imageability, “The image of the city”, The MIT press, Cambridge (USA), 1960. “...imageability: that quality in a physical object which gives it a high probability of evoking a strong image in any given observer. It is that shape, color, or arrangement that facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment. It might also be called legibility, or perhaps visibility in a heightened sense, where objects are not only able to be seen, but are presented sharply and intensely to the senses. [...] A highly imageable (apparent, legible, or visible) city in this peculiar sense would seem well formed, distinct, remarkable; it would invite the eye and the ear to greater attention and participation. The sensuous grasp upon such surroundings would not merely be simplified, but also extended and deepened. Such a city would be one that could be apprehended over time as a pattern of high continuity, with many distinctive parts clearly inter-connected. The perceptive and familiar observer could absorb new sensuous impacts without disruption of their basic image, and each new impact would touch upon many previous elements. They would be well oriented and could move easily. They would be highly aware of their environment.”

[3] Kevin Lynch on way-finding, “The image of the city”, The MIT press, Cambridge (USA), 1960. “In the process of way-finding, the strategic link is the environmental image, the generalized mental picture of the exterior physical world that is held by an individual. This image is the product both of immediate sensation and of the memory of past experience, and it is used to interpret information and to guide action. The need to recognize and pattern our surroundings is so crucial, and has such long roots in the past, that this image has wide practical and emotional importance to the individual.”

[4] Colin Ellard, “Places of the heart. The psychogeography of everyday life”, Bellevue Literary Press, New York, 2015.

[5] Ludovica Scarpa, “Spazi urbani e stati mentali: come lo spazio influenza la mente”.

[6] Jan Gehl about human activities, “Cities for people”, Island Press, Washington, 2010. “A common characteristic of life in city space is the versatility and complexity of the activities, with much overlapping and frequent shifts between purpo-

seful walking, stopping, resting, staying and conversing. Unpredictability and unplanned, spontaneous actions are very much part of what makes moving and staying in city space such a special attraction. We are on our way, watching people and events, inspired to stop to look more closely or even to stay or join in.
A clear core pattern emerges from the great diversity of activities in city space. One simple way to look at them is to put the most important categories on a scale according to their degree of necessity. At one end of the scale are the purposeful necessary activities, that is, activities that people generally have to undertake: going to work or school, waiting for the bus, bringing goods to customers. These activities take place under all conditions. (necessary activities)
At the other end of this scale are the largely recreational optional activities that people might like: walking down the promenade, standing up to get a good look at the city, sitting down to enjoy the view or the good weather.
The great majority of the most attractive and popular city activities belong to this group of optional activities, for which good city quality is a prerequisite.
If outdoor conditions make walking and recreation impossible, such as during a snowstorm, just about nothing happens. If conditions are tolerable, the extent of necessary activities grows. If conditions for being outdoors are good, people engage in many necessary activities and also an increasing number of optional ones. Walkers are tempted to stop to enjoy the weather, places and life in the city, or people emerge from their buildings to stay in city spaces. Chairs are dragged out in front of houses and children come out to play.

For good reason, climate is mentioned as an important factor for the extent and character of outdoor activities. If it is too cold, too hot or too wet, outdoor activities are reduced or rendered impossible.
Another very important factor is the physical quality of city space. Planning and design can be used to influence the extent and character of outdoor activities. Invitations to do something outdoors other than just walking should include protection, security, reasonable space, furniture and visual quality.
The city life studies mentioned also document the great opportunities for actively inviting people not only to walk, but to participate in a versatile and varied city life.

Cities and urban areas can set the stage for specific activities. In the inner city streets of Tokyo, London, Sydney and New York, people walk: there isn't room for anything else. In vacation and tourist areas, where passing the time, consumption and pleasure are top priorities, people are invited to stroll and stay a while. In traditional cities such as Venice, people are invited to a versatile and complex city life where there are good conditions for both pedestrian traffic and staying. Corresponding patterns of activity can be found in Copenhagen, Lyon, Melbourne and in other cities, large and small, that have significantly improved conditions for life in city space in recent decades. Pedestrian traffic has grown and the number of recreational optional activities has swelled.

Although pedestrian traffic has traditionally dominated the streets of Manhattan in New York City, in 2007 an extensive program was launched to encourage greater versatility in city life. The idea was to provide better options for recreation and leisure as a supplement to the extensive purposeful pedestrian traffic. For example, on Broadway expanded sidewalks have provided room for café chairs and places to stay, while a number of new car-free areas with many opportunities to stay have been established at Madison Square, Herald Square and Times Square. In all these cases the new opportunities were adopted at once. Almost day-by-day the new invitations have enriched city life and made it far more multifaceted. Even in New York City there is obviously a need for city space and great interest in participating more in city life now that there are more opportunities and solid invitations.

That both the character and the extent of city life are influenced dramatically by the quality of city space is in itself an important connection. The connection becomes even more interesting if we look at the relationships between necessary, optional and the important group of social activities. If city life is reinforced, it creates the preconditions for strengthening all forms of social activity in city space.

Social activities include all types of communication between people in city space and require the presence of other people. If there is life and activity in city space, there are also many social exchanges. If city space is desolate and empty, nothing happens.
Social activities include a wide spectrum of diverse activities. There are many passive see and hear contacts: watching people and what is happening.
This modest, unpretentious form of contact is the most widespread social city activity anywhere.
There are more active contacts. People exchange greetings and talk to acquaintances they meet. There are chance meetings and small talk at market booths, on benches and wherever people wait. People ask for directions and exchange brief remarks about the weather or when the next bus is due. More extensive contact can sometimes grow from these short greetings. New topics and common interests can be discussed. Acquaintanceships can sprout.
Unpredictability and spontaneity are key words. Among the more extensive contacts are children's play or the young people who "hang out" and use city space as a meeting place.
Finally, there is a large group of more or less planned common activities: markets, street parties, meetings, parades and demonstrations."

[7] Roger Narboni, "A framework of darkness: Lighting master plan for the City of Rennes", PLD magazine n.89, Via Verlag, 2013.
"Since 1987, when we launched the idea of light urbanism as a form of town planning and developed a methodology for lighting master planning, we have undertaken more than 110 studies of this type. In doing so, we naturally began a gradual process of considering the possible links between light and darkness in cities.
In 2002, while designing the lighting master plan for the village of Talmont-sur-Gironde in southwest France, we created and implemented a darkness master plan for the village as a whole, to preserve but redefine the simplicity of the atmosphere in the narrow streets at night.
More recently, in 2010 while developing a lighting master plan for the historical centre of Jerusalem, we very quickly suggested to the client that we might redefine, preserve and improve the darkness in the green belt being developed around the old part of town to create an area of blackness that, by contrast, would enhance the future illumination of the town walls.
In Rennes, we have continued and developed this darkness-based "less is more" approach by looking in greater depth at our theory of the respective roles of light and darkness in towns. From the beginning of our study, and during discussions and exploratory night-time walks with local people in various districts in Rennes, we were struck by the number of times they drew attention to the excess lighting in the city and by their wish to preserve darkness in large expanses of the natural open spaces."

[8] For further information about "non-places": Marc Augé, "Non-places: Introduction to an anthropology of supermodernity", Verso, 1995.

[9] http://www.zumtobel.com/active-light.html, Active Light – Connecting with Nature, Zumtobel, Dornbirn, Austria