Developing a Method for Analyzing and Documenting Impact of Lighting on Livability of Cities: Case of Mashhad, Iran

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ABSTRACT

The night phase of cities has traditionally hosted extra events and activities in history. However, urban night in the 21st century seems to host additional happenings, new users, and a wide range of new activities. This study investigates 24/7 cities and cities of lights throughout history and the notion of light in Persian culture and specifically in the case of Mashhad, the second-largest city of Iran. The city was observed at four scales, from inside houses to the urban facades and urban spaces and beyond the boundaries of the city in the context of cultural geographies of the Islamic world. The study brings up the theory of urban lighting affecting cities' livability by defining the area of influence of lighting on quality of life and puts a step toward providing a systematical framework for analyzing urban lighting of cities through qualitative and quantitative measures. Potentials of Cellular Automata to be used as a basis for creating an automated night map of the city are also examined. Three key concepts were identified: population growth pushes activities and users into the night phase of cities; authorities play a significant role in the formation of 24-hour districts, and ideologies and local culture can support and provide safety for urban nightlife. In the case of Mashhad, ideology seems to have played a crucial role in the formation of urban nightlife. At the same time, the financial and social aspects of developments are originally subordinate to the ideology.

Keywords: Public space, urban lighting, urban night, culture of cities, city of lights, nightlife, nighttime economy

ÖZ

Şehirlerin gece evresi geleneksel olarak tarihte ekstra etkinliklere ev sahipliği yaptmiştır. Bununla birlikte, 21. Yüzyılda gece aktivitelere daha fazla önem kazanmaya başladı, yeni kullanıcılar ve daha etkin gece kullanımı gözlemleye başlamıştır. Bu çalışma 24/7 kent konseptini ve bu bağlamda 'ışık' şehirlerini, özellikle Fars kültüründeki 'ışık' kavramını ve İran'ın ikinci büyük şehri Mashhad'ı örnek çalışma olarak araştırmaktadır. Mashhad kenti, İslam dünyasının kültürel coğrafyaları bağlamında evlerin içinden kentsel cephelere ve kentsel alanlara ve şehir sınırlarının ötesine kadar dört ölçekte gözlemlendi. Çalışma, aydınlatmanın yaşam kalitesi üzerindeki etki alanını tanımlayarak şehirlerin yaşanabilirliğini etkileyen kentsel aydınlatma teorisini gündeme getiriyor ve şehirlerin kentsel aydınlatmasını nitel ve nicel önlemlerle analiz etmek için sistematik bir çerçeve sağlamaya yönelik bir adım atıyor.

Cellular automata uygulaması yardımı ile Masshad kentin gece haritasını oluşturulmuştur, ve bu bağlamda gece kullanım potansiyelleri incelenmiştir. Sonuç olarak üç temel sonuç gözlemlenmiştir : nüfus artışı gece faaliyetlerini arttırıyor ve kullanıcıları şehirlerin gece aşamasına itiyor; yetkililer 24 saat açık bölgelerin oluşumunda önemli bir rol oynar ve ideolojiler ve yerel kültür kentsel gece hayatını destekleyebilir ve güvenliği sağlayabilir.

Mashhad örneğinde, ideoloji kentsel gece hayatının oluşumunda çok önemli bir rol oynamış gibi görünmektedir. Aynı zamanda, gelişmelerin finansal ve sosyal yönleri başlangıçta ideolojiye bağlı.

Anahtar Kelimeler: Kamusal alan, kentsel aydınlatma, kentsel gece, şehirlerin kültürü, ışık şehri, şehir markası, gece ekonomisi

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INTRODUCTION

1.1 Problem Definition

Rapid improvements in lighting technologies are changing the night face of cities rapidly by transforming the nightscape from static to dynamic and from dark and monochrome to bright and colorful. The night-time image of cities is changing dramatically while the design and management of urban spaces are mainly focused on day-time life of cities. There are available standards regarding illuminating urban spaces. However, these generalized rules are considered as minimum requirements appropriate for the basic functioning of the space. Hence, there is no framework for a systematic approach to urban night. There have been valuable studies on specific aspects of the urban night like safety and security-related issues. However, the scenario of the urban night as a whole includes many factors that are actually shaping the nightlife of cities but are not well discussed in urban studies. To name one of these actors, we can address urban digital screens that are playing a significant role in the characteristics of urban spaces at night. At the same time, some cities are losing their previous identity such as Mashhad, and some, with the power of light, have got a new identity such as Lyon. This study tries to shed light on the dark phase of cities and investigate potentials and possibilities of using this extra source of time and space to improve urban public spaces. Moreover, while the role of lighting in the livability of urban spaces is significant, there is no actual methodological assessment tool to clarify and measure possible impacts of urban lighting on livability. Rapid improvements in

the lighting industry are forcing the market on excessive use of light. As a result, there are highly illuminated urban spaces that bombard whoever passes by with lots of colored changing lights and advertisement information from digital screens, disrupting humans' circadian cycle and misdirecting wildlife, especially birds, while over brightening the sky and vanishing the darkness. At the same time, light is not available where it is needed and can be effectful on changing the lost spaces of cities into a useful, desired, and safe environment where people can enjoy, rest and socialize in open public spaces at night.

1.2 Research Gap and Significance of Study

There are numerous studies in the field of livability, and there is a ‘competition’ to define this concept and provide an assessment method to rank the most livable cities. A very comprehensive study is the City Analysis Methodology (CAM) which was developed by a group conducted by Joanne M.Leach between the years 2012 and 2017, which provides 347 indicators for examining performances of British cities. However, in this study and in numerous studies related to livability, urban lighting's possible effects on livability are almost ignored completely.

The number of research on urban lighting is relatively low compared to livability subject and mostly limited to night's safety and economic aspects. Revitalization plans of central business districts of British cities ignited a spark in the study of the urban night. Significant studies in this regard have been investigated by Heath (1997), Landrey & Bianchini (1995), Adams (2007), and Demant & Landolt (2013). These studies are among many works with a focus on night-time economy and consequences of applied regulations in mentioned cases. Although they may not have been mentioning the livability term, their research results show how the presence of light

and activity consequently affects livability conditions. Thus, one problem that is addressed in this research is to emphasize previous studies and the ignored role of lighting on the quality of urban life to demonstrate a clear connection between lighting and livability.

An additional problem showed to be the lack of knowledge from cultures that have been dealing with light in different ways. Literature review reveals that academic atmosphere research highly focuses on the utilization of light on examples from western contexts while the fact that different approaches toward use of night phase of cities around the world is less investigated. Specifically, very few studies are available in English sources regarding lighting and livability in Middle East and specifically in Mashhad. One significant study is done by Atepheh Amid (2013) on Samen district, the historical core of city, which is focused on pilgrims and effects of urban regeneration projects near Imam Reza's shrine complex on utilization of urban spaces.

Another identified gap was the lack of a systematic method for analyzing urban lighting. Different methods are pursued for investigating daytime issues of urban spaces, but the night is different, and its users, problems, and potentials are also different from daytime. Lack of a missing framework as a foundation stone to connect, order, and organize investigations around the urban night's subject is being felt.

1.3 Aims and Objectives

Considering problem definition and identified gap in the previous section, the primary aim of the study is as follows:

- To develop a method to analyze the impact of lighting on the livability of cities.

The secondary aims are:

• To develop a method for documenting existing urban lighting conditions of cities as a basis for urban planning in the city scale. (The result can be used in lighting master plans or in the scale of district/region in urban design and regional lighting projects.)

• Exploring and documenting the notion of light in Persian culture and specifically urban lighting in the city of Mashhad.

In order to achieve the aims of the study, the following objectives have been pursued:

- To explore the nightlife activities in the city (Mashhad)
- To study the relationship between livability /24-hours city and urban lighting
- To study the livability of cities in a broader sense
- To study cellular automata method as a tool to document urban lighting

1.4 Research Questions

The main question of this study is;

1- What is the area of influence of lighting on livability?

And secondary questions are;

2- How and to what extent the impact of urban lighting on livability can be measured?

3- How urban lighting may affect and get affected by regional cultures?

4- How can we create a systematical mapping method for documenting urban lighting and night-time activities?

1.5 Research Limitation

This study is limited to the role of artificial lighting on urban elements such as building facades and contours, urban edges including architectural and non-architectural elements such as urban screens and monuments, and their effects on urban spaces and on perception, health and psychological needs of users.

While international examples have been reviewed, the in-dept investigation is limited to the case of Mashhad city. Also, it is important to mention measurements of levels of light and their geographical location for cellular automata map were taken in 2020 during Corona pandemic which we believe have affected in lower presence of people in urban spaces.

Limited availability of statistical data related to night-time issues of city, such as crime rate, vehicle accident rates, number of night-shift workers, revenue of night-time economies and inward investment GPD has resulted in limited outcome of nightlife indicators.

1.6 Methodology and Data Collection

This study follows an exploratory mixed-method approach applying qualitative and quantitative methods accompanied by a case study analysis. As mentioned by Ying, a mixed-method is an approach that combines qualitative and quantitative approaches, resulting in substantial benefits and leading to a 'strong analytic strategy' (Yin, 2009:132; Yin, 2012).

Qualitative research based on Creswell (1994) is an analysis process of understanding, grounded on 'distinct methodological traditions of inquiry that explore a social or human problem' (Cresswell, 1994). It is an inductive process while the researcher is interacting with what is researched. The researcher is building a complex, holistic picture, while the reality is subjective and multiple (Cresswell, 1994).

Table 1: Quantitative and Qualitative Paradigm Assumptions

Question	**Quantitative**	**Qualitative**
Ontology: What is the nature of reality?	Reality is objective and singular, apart from the researcher.	Reality is subjective and multiple as seen by participants in a study.
Epistemology: What is the relationship of the researcher to that being researched?	Researcher is independent from that being researched.	Researcher interacts with that being researched.
Methodology: What is the process of research?	Deductive process: cause and effect.	Inductive process: Mutual simultaneous shaping of factors.

One of the main reasons for conducting a qualitative study is the exploratory nature of the work. This is the case if there is less research about the topic or the population being studied (Cresswell, 1994). On the other side, quantitative research is designed deductively, meaning there is a relationship between cause and effect, resulting in concrete, measurable results.

The study starts with a qualitative analysis of urban spaces while at the same time efforts have been made to identify those quantitative indicators that reflect characteristics of urban night life of the city. The documentation process is also a mixture of qualitative aspects of case study through pictures and narration in text and quantitative aspects of existing conditions by measuring actual light levels.

The analysis of the case started with the observation of active areas at night and taking pictures of urban spaces in which the presence of people was dominant as well as landmarks, buildings and urban structures which were illuminated by private or public sectors were taken between 2009 and 2020. In addition, pictures have been taken from shops that were open in the case study between 1:00 am and 3:00 am during a specific time (between 15th of September and 19th of October 2020).

In order to be able to reflect the level of night-time activities, their density, and their distribution within the city, quantitative measurements were taken into consideration by measuring levels of light by a specific device (Luxmeter) in front of the before-mentioned shops. These measurements were located with the help of mobile network's GPS and reflected as a light-dark pattern on the map of the city, which we named as 'night map'. While the night map visualized city's nightlife by quantitative measurements, an additional step was taken to examine the power of computer science in helping the study of urban night. For this purpose, a tailor-made software was developed based on cellular automata concept and the produced night-map has been put into it. The outcome of the quantitative section is measurements of night life accessibility and prediction of future growth.

By exploring literature on the subject of urban lighting, it was pointed out main focus is mostly around three subjects of safety, smart lighting, and revitalization projects of central business districts in United Kingdom. Few sources were found on the subject of outdoor colored lighting and focus of light. At this point, the gap in the literature on the subject of urban night and urban lighting became visible, as discussed before in this section. Research continued by careful observation of cities known as cities of lights, trips made to Lyon and Eindhoven, and combined with frequent visits to hometown Mashhad. During these visits, efforts were made to document the nightscape of cities and specifically cultural clues and trends concerning the use of light. After gathering information from observation and library research, a second gap in the literature regarding the influence of lighting on livability of cities became visible. In order to be able to define the area of influence of urban lighting on livability, a clear vision toward a definition of livability concept was necessary. After defining livability, the area of influence of lighting on livability became visible, and the

necessity of having a case study to develop the framework further to evaluate urban lighting became essential. Considering the cultural history of Mashhad, the current status quo of the city regarding considerable use of urban lighting, and the researcher's knowledge from living there for 25 years, Mashhad was chosen as the case study. By choosing the case and having the chance to re-visit the city and considering the lack of available systematic approach regarding urban lighting, the decision was made to document the location of active nodes at night and levels of light on each node for further investigation. By looking further into possibilities of using the created night map of the city and considering the fact that cellular automata works with providing a unified rule to apply on any number of nodes on a two-dimensional basis, cellular automata was chosen to be used to document the urban night while providing the possibility to show the current area of effect of each node and predict the future growth of urban night network.

1.7 Research Structure

This study consists of six chapters. Chapter 1 gives an overview of the background of the study with its main aims and objectives, research questions, and research approach. The study continues with comprehensive library research to examine the literature on urban night and the effects of urban lighting on urban spaces reflected in Chapter 2.

In Chapter 3, livability is defined, and dimensions commonly mentioned in literature are identified and categorized (table 4). In order to identify the area of influence of lighting on livability research continues with a continual observation of cities of light and documentation of qualitative aspects of nightlife in urban spaces in eastern and western contexts. At this stage, it's been concluded that case study research would be an appropriate approach to document less discussed role of culture on the use of public

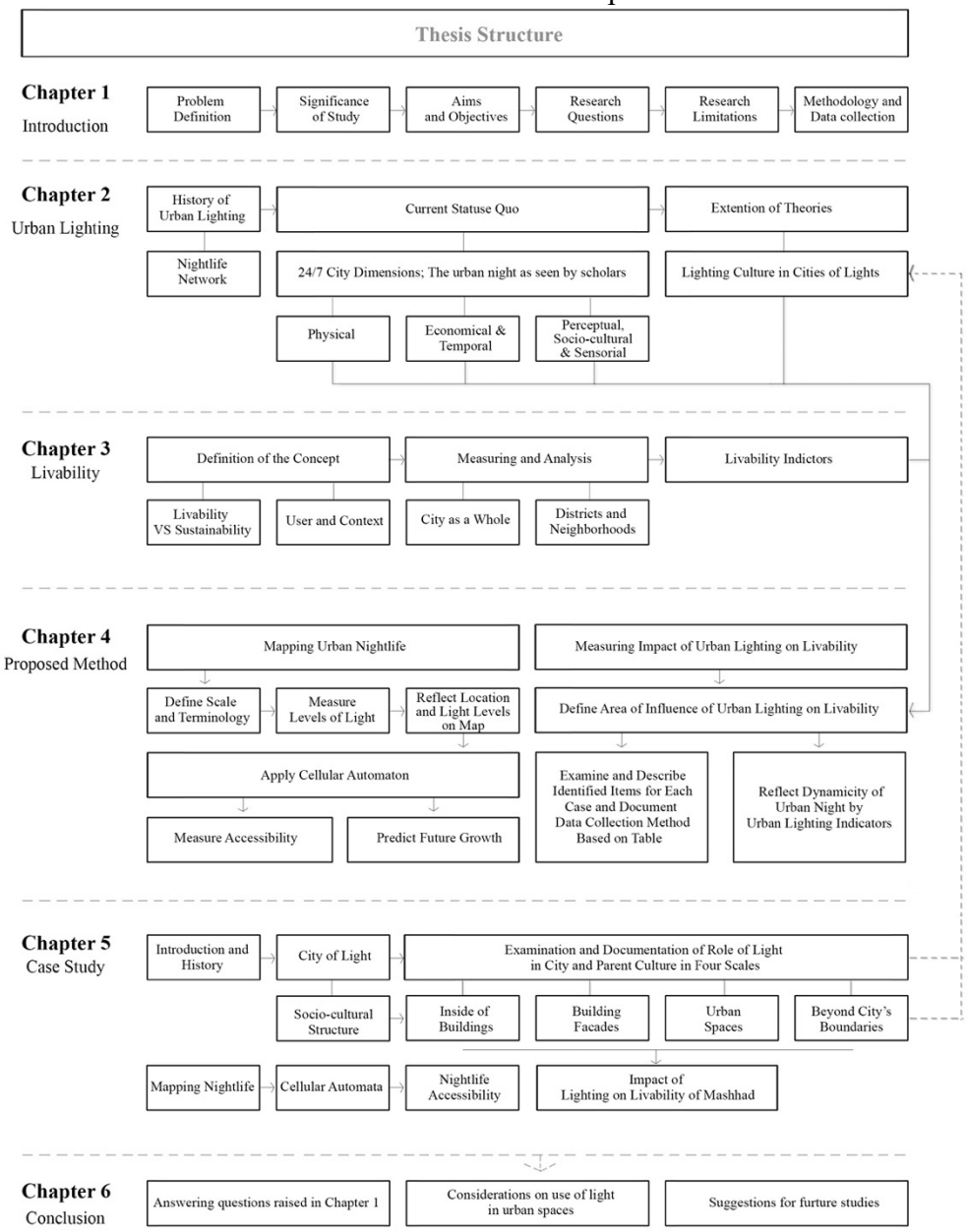
spaces at night as well as providing a basis for further evaluation of lighting on livability.

Chapter 4, which is the main outcome of the research focuses on filling-in the identified gap in the context of livability by identifying area of influence of urban lighting on livability and the method proposed which provides a tool to reflect nightlife of cities through simple measurements as a 'Nightlife Indicator' as well as a documentation method which works with measuring actual levels of light at nightlife hotspots and reflection of its effect and its growth in the scale of city by cellular automata.

Chapter 5 is the application of the method in the case of Mashhad city, the second-largest city of Iran. The reason behind choosing Mashhad was that the author was familiar with cultural traits and events, and the city has a dominant and active nightlife. In addition, many urban lighting projects have been applied in the city, and people have shown to be enthusiastic toward the use of light, as can be observed by the illumination of apartments, retails, and other private buildings. In this chapter, qualitative aspects, which are essential components of the current study, are documented through narration and pictures, as these methods are found to be the only way to grasp the socio-cultural traits of the society.

In the following table (Table 2), chapters and their logical connection is shown.

Table 2: Thesis Structure and Chapters' Relations



Chapter 2

URBAN LIGHTING

2.1 Development of Nightlife Network

While the literature on urban studies is primarily focusing on the daytime subjects and images of public spaces, there is a neglected phase that is growing bigger by increasing urbanization and the help of lighting technologies. Sharpe (2008, p. 14) calls the night phase a ‘‘second city— with its own geography and its own set of citizens’’ and McQuire (2008, p. 114) states, ‘‘there are relatively few accounts to theorize the impact of electric lighting on the experience of urban space.’’ In this section, theories on urban night and light and their possible effects on human behaviour and public spaces are further investigated.

Long before the invention of gas and later electricity-based lights, urban lighting existed with a very limited duration and function. Each empire/authority had its own reasons to make a celebration in the scale of the city. Sometimes for religious/rituals purposes or for celebrating a victory in war or simply to serve entertainment purposes in public spaces as it was happening in Roman Empire. Urban lighting has always been in favor of authorities. However, it was very costly with oil or similar fuel lamps, and it was mainly limited to one public space or area for a limited duration of time. The city's night-time image provided by urban lighting was like a small node within the whole, compared with daytime image of city. The baroque period was the last era of

this nodal urban lighting with specifically prominent night-time activities trying to make the shift toward permanent street lighting.

Koslofsky (2002) points out an important period in the history of Europe when princes, courtiers, burghers, and bureaucrats promoted new levels of nocturnal business and pleasure in the Baroque period by developing new lighting technologies for the stage and the street. They conquered the traditional notion of the night, which is always related to natural and supernatural dangers and brings out an aura of pleasure and sociability. German publisher Bertuch (1800) mentions this phenomenon as an entirely new order of things, where "the pleasures of the evenings and night are the ruling fashion in every large city, where luxury and the need for entertainment constantly increase." It should be stated that from eighth Henry (Bertuch's time) English mealtimes and later the sleeping times had shifted seven hours. Koslofsky (2011) points out a change in the history of Night: "between the fifteenth and the eighteenth centuries, princely celebrations show a slow shift from the street to the court, and from day to night. This was the sharpest break in the history of celebrations in the West, ..marking a new era in the history of the night." (P. 235)

In 1660, no European city had permanently illuminated its streets; the first city to enjoy public street lighting was Paris (1667) by large candle lanterns, followed by Amsterdam (1669), Hamburg (1673), Turin (1675), Berlin (1682), Copenhagen (1683), and London (1684-1694). This was the beginning of the second stage of urban lighting, where the night-time image became linear in form and integrated few functions by connecting nodes via the lit street. The figure below shows oil lamps in glass-paned lanterns, the first permanent street lighting element.

Figure 1: Early example of permanent gas-based street lighting (Koslofsky,2011)

Street lamp-lighter was a profession that flourished in the 19th century, with the proliferation of gas lamps in the capital. The lamp-lighters employed by the town hall were deployed in the city after dark to illuminate the streets of Paris and were in the opposite direction from 6 am to extinguish. However, a craft disappeared with the advent of the light bulb in 1889.

Figure 2: Street lamp-lighter was a profession in the 19th century

With the invention of electricity in 1880 and consequently electricity distribution system by Edison upgraded the urban lighting from linear to network forever, where many functions got involved. Gradually the size and complexity of the night-time image of cities got closer to the day-time image of cities. This period can be considered as the emerging point of 24-hour cities.

2.2 The 24/7 City

The term, 24-hour city, has been used to label cities known to be active late into the night hours (Heath, 1997). In some cases, mainly in cases of smaller cities, activities may extend only a few hours after dusk, or maximum, until midnight. However, it seems that wherever population or wealth increases, the number of night-time activities and length of their extension after dark grows relatively.

Throughout history, port cities were potential 24/7 cities, and some of them are still active, like Amsterdam. However, new means of transportation and technology provided the chance for a city like Las Vegas to become a prominent 24/7 city in the middle of a desert. Other cities like Lyon-France and Eindhoven-Netherlands have benefited from this term (24/7 city) as their city branding attempts while they are not actually twenty-four hours active during the whole year. It seems that in larger cities, the urban nightlife is occuring with or without planned decisions unless there is a rule of force to control or limit it (due to high costs of safety provision, for instance, in the case of Tehran). However, these limitations do not elliminate the nightlife concept but push it to take place as an underground activity and transfer nightlife from urban spaces toward interior spaces.

Fortunately, the history of such examples in Western Europe is partially documented and accessible in literature. Early signs of 24-hour city urban spaces were observed in many European cities in the Baroque period. Richard Alewyn (1989) was the first to point out a shift in the history of the night: “Between the fifteenth and the eighteenth centuries, princely celebrations show a slow shift from the street to the court, and from day to night. This was the sharpest break in the history of celebrations in the West, “….marking a new era in the history of the night” (Alewyn, 1989, pp. 37-39). The all-night illumination of courts was likely the starting point of having 24-hour lit active spots in European cities. Though it was called ‘abuse of illumination’ by bourgeois critiques in the case of Leipzig, later, when lanterns were placed on public streets, as documented on an engraving from 1702 (Figure 3), it was appreciated. Koslofsky’s (2002, p.149) narration of the engraving uncovers many aspects and anticipations of urban lighting: “In the foreground left, a man reads by lantern light; couples stroll and admire the city’s new Baroque mansions while two men, able to recognize each other despite the darkness, doff their hats. In the background, a night watchman stands guard.”

Figure 3: Leipzig Street Lighting Scene, 1702 Source: Koslofsky, 2002

These street lighting efforts signified passage from the first stage. Courts were individually illuminated spots within the city, to the second stage of urban lighting wherein a few urban nodes with essential functions and courts were connected via linear installations of lanterns along primary routes. Starting in 1880, the third stage of urban lighting started with Thomas Edison's invention of electricity and, consequently, his electrical distribution systems. As Gallan and Gibson (2011, p:2511) described, "industrialized lighting in cities transformed visibility at night in ways never before experienced," and a sociological link has been drawn between increased visibility and increased activity at night. At this stage, urban lighting upgraded from linear connections to a network of lit-at-night areas (Figure 4). The third stage provided a chance for urban open spaces to host a variety of functions. Progressing in the middle of the 20th century, new activities started to occur at night in urban open spaces. In the fourth (current) stage, link by link, the numbers of active functions and facilities at night have increased, and gradually a new image of the night-time city has formed.

The size and complexity of the night phase functions (specified as City` in figure 4) have grown, and the night-time city does not necessarily reflect the daytime city. Certain activities and happenings specifically belong to the night phase, lending unique characteristics compared to the daytime.

A well-known example is the original Woodstock music festival, held in 1969 in Bethel, New York. Although Woodstock took place in a rural open space, the fact that a festival could be active non-stop for three days and nights depicts a starting point of the new wave of activities that were yet to happen, such as night ravings and festivals of lights. According to Tim Heath (1997), the emergence of 24-hour cities in Britain began during the late 20th century when outdoor cinemas, light festivals, concerts, and other entertainment events became modular parts of pop culture. The Nobel prized invention of blue light-emitting diodes (LED) in the early 1990s ("The Nobel Prize in Physics 2014", 2014) completed the color range spectrum of LEDs, facilitated colored and dynamic lighting as well as a vertical expansion of digital screens on urban facades as new characteristics of the urban night. In future stages, the night phase of large cities and metropolitans may become more active and complex than many midsize cities' daytime activity.

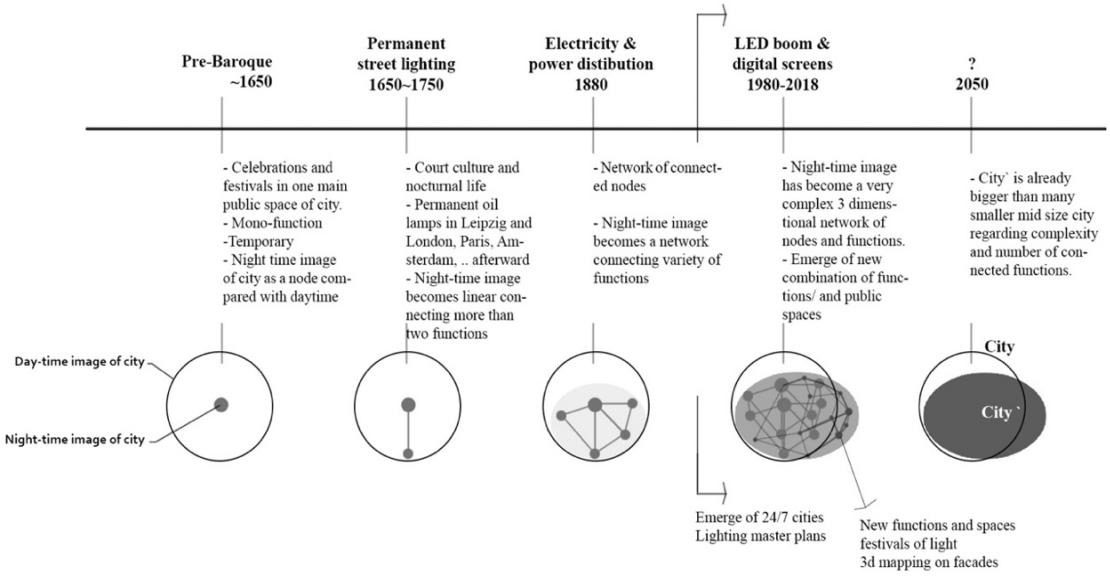


Figure 4: Evolution of night phase of cities, Source: Talebian and Riza 2020

Within a century after the invention of electric street lighting, the magical and mystical effects of having lit streets at night decayed. As the third and fourth generations have been born to see illuminated streets at night, like other similar infrastructures such as highways and bridges, street lighting is now considered as an essential element of urban life without its glorious effect. Urban lighting, however, is now becoming more than street lights. Colorful and dynamic lights in greeneries and on urban facades together with a wide range of night-time activities seem to attract the curiosity of new generations. The formation of 24/7 zones within cities seems to be a natural response of having free time at night. Especially the young generations expect ‘something ’ more exciting than having street lights which were once considered luxurious and still are the primary function of urban lighting. However, there are many scenarios that are against the demand for more options, possibilities, and places to go at night. These regulations and restrictions are mainly implied by authorities due to lack of budget for providing safety or lack of knowledge from the hidden potentials of the night phase because simply it was not achievable before . Limited working hours of 9 a.m. to 5

p.m. applied to central business districts of British cities and later on the 24-hour city concept to bring back the nightlife to these areas, a well-documented example of fall and rise of 24/7 districts, is investigated in this section. An example of an uninterrupted 24/7 district is also available in the case of Mashhad city, which is explored in detail in section five of the current research.

Tim Heath (1997) has explored emerge and application of the twenty-four hour city concept in British cities. He reviewed how nightlife, which was essentially active before industrialization, was excluded from city centers due to the regulation of nine-to-five retailing and office centers. Moreover, Heath explores how governors and policy makers tried to re-capture night-life in the post-industrialization period by extending the working hours of night-time economies. According to Heath review of British initiatives reveals the Twenty-four Hour City approach's three primary intentions: developing the evening economy of the city; improving the city's image to attract inward investment; providing a safer city centre for a broader spectrum of the population to enjoy without fear.

Rank	Reason	%	Authority
1	Safer city	91	Bristol, Cardiff, Glasgow, Hackney, Leeds, Liverpool, Manchester, Newcastle, Nottingham, Sheffield
2	City image/Inward investment	64	Bristol, Cardiff, Glasgow, Leeds, Liverpool, Manchester, Nottingham
3	Economic regeneration	54	Bristol, Cardiff, Hackney, Manchester, Newcastle, Sheffield
4	Local service provision	36	Cardiff, Hackney, Manchester, Sheffield
5	Specific local reason/Event	27	Manchester, Newcastle, Sheffield
6 =	Other city's lead	18	Islington, Newcastle
6 =	DOE	18	Islington, Sheffield

Figure 5: Reasons for adopting a twenty-four Hour City strategy, Source: Heath 1997

Landrey & Bianchini (1995) argue that approaches toward the revitalization of night-time economies should ‘exploit’ a city's cultural and social potential. They call for the

“creative energies “ such as carnivals and festivals to become part of mainstream city life. Accordingly, this could be achieved, for example, through the promotion of “ theatres, evening classes, conferences, cafes, and clubs, as well as street animation and activity in the night-time economy.” (P.10). Besides, Heath points out the effects of local authorities' initiatives such as licensing, Street Lighting, and CCTVs on reducing fear of crime.

City	Desired timescale (hours)	Key initiatives
Leeds	24	Licensing, retail, cafés/rest., lighting, CCTV, festivals, theatre
Manchester	24	Licensing, retail, cafés/rest., lighting, CCTV, festivals, street events
Sheffield	20	Licensing, cafés/rest., CCTV, cultural ind., theatre
Liverpool	20	Licensing, cafés/rest., CCTV, theatre, street events
Cardiff	24	Cafés/rest., lighting, CCTV, festivals
Glasgow	18	Retail, cafés/rest., lighting, CCTV
Nottingham	20	Retail, cafés/rest., theatre, street events
Newcastle	20	Licensing, CCTV

Figure 6: Twenty-four hour initiatives adopted by local authorities, Source Heath (1997)

Further analysis in this section has been reviewed through the lens of dimensions of urban studies as defined by Carmona (2010) as; morphological, functional, perceptual, social, visual, and temporal dimensions. Functional and morphological that are more related to physical aspects are investigated together. Perceptual and socio-cultural dimensions were found to be interlocked topics that are quite effective factors in the formation of urban night, hence considered as the main focus and investigated together followed by temporal and economic dimensions and finally the visual dimension.

2.2.1 Physical Dimension

Investigating the context of 24-hour activities or places, some specific functions would be recalled in our minds depending on our past experiences. While for a person living in Berlin, London, or in other European capitals, nightlife is associated with bars,

clubs, and alcohol-related activities. On the contrary, for a person living in Mashhad, Iran, nightlife is associated with public spaces of the Shrine Complex as the place and night-long traditions and rituals together with indoor private gatherings and parties as activities (explained in detail in chapter five). In this section, nightlife hotspots and their physical characteristics have been seen through their relationship with hosting functions. Efforts have been made to answer basic questions of; Where to go at night? Furthermore, What to do at night? To investigate locations and functions that build up the urban night.

Campo and Ryan (2008) investigate American mid-size cities searching for a new urban nightlife which is "neither the sophisticated entertainment of theater, symphony or ballet, nor high-end entertainment serving the needs of corporate clients." They define 'Entertainment Zones' as "concentrated nightlife districts occupying the margins of downtowns in former commercial and industrial areas, underutilized retail corridors or underdeveloped waterfronts". These areas are urban leftover spaces resulting from "voracious development processes that have filled American cities with corporate skyscrapers, freeways, acres of car parking lots and mega-scaled retail projects" ignored by planners and architects(p.292). They also point out the temporal dimension of these zones as they are almost invisible during the day and do not have a physically dominant presence and unplanned and self-organizing nature. The contributing role of small vacant lots that are mainly used as parkings during the day and change to other activities at night has also been observed in the case of Mashhad, where smilar cases of the formation of food-streets and night-markets were observed explained in details in Chapter five.

According to the study by Campo and Rayan (2008) on 29 American cities, entertainment zones are mostly active in former industrial and commercial buildings that " have outlives their original uses and have survived largescale developments and planning programs." These buildings are located on edges of downtowns around former industrial or commercial districts, which "makes them easily accessible to downtown workers and nearby residents while placing them in a relatively familiar territory for suburbanites" (p.293). While noise and traffic of highways make adjacent lands less attractive choices for redevelopments, especially for residential uses, accessibility and visibility of such areas increase the potential of an active node to be extended toward empty lots and parks and become an active zone.

British cities' experience on central business districts (CBDs) and the Twenty-four Hour City concept to revive nightlife in these areas has shown possible drawbacks of lack of diverse functions resulting in segregation of night. In order to have a 24-hour active area, the urge to have diverse functions that cover different times of day/night is necessary. Wherever functions are restricted to one or few, the possibility of colonization of night by specific age/gender group increases. The problem in British cities' examples started by allocating business-only districts in cities that became empty, undesired, and unsafe after 5-6 p.m. Later licensing initiatives brought back restaurants, bars, and clubs, mostly alcohol-related functions. These initiatives improved safety in these areas (Heath,1999), however, led to colonization of night by youngsters and to some extent male users, leaving no space for elders and families or those who are not in favor of drinking alcohol such as Muslims. (Valentine, Holloway & Jayne, 2010) Residential blocks within 24 hour areas bring conflict of benefits in almost every context, especially when alcohol related functions are involved. While residents close to active nodes at night have complains about the unrest made by noises

at night and urinations in public spaces ((Bianchini, 1995), existence of residents in such areas is good for the safety and economy of the area as Heath (1999, p.201) concludes “A residential population helps to create a living city—providing natural surveillance—and adding to the demand for the products of the night-time economy.” A solution for these conflicting interests might be considering only temporary accommodations such as hotels and hostels. Examples of 24-hour active districts observed by author including Samen district in Mashhad, Istiklal street in Istanbul, and Red-light district in Amsterdam shows the tendency of society to change functions from permanent residential to temporary formal or informal accommodations, with or without regulations, due to above-mentioned issues plus economic revenue of accommodation in touristic areas. Formal accomodations include hotels and hostels and informal ones includes renting flats by dedicated websites like Airbnb.com or similar mechanism.

There seems to be similarities in some aspects of nightlife regardless of geographical and cultural differences. Fot instance different forms of gathering is common. A possible reason is that humankind still depends on naturally developed sense of safety being in a crowd provides. Another common activity is the early morning eateries and breakfast mini-restaurants that seems to be formed for those who to get to work very early and don’t eat brealfast at home. A prominent example of permanent customers of early breakfast eateries include working class in general and construction workers and municipality workers in street cleaning and garbage collecting sections specifically.

Beside natural resources such as parks, canals, and seafronts act as a ground for further functions and gatherings to urge, in man-made environments, public places such as

cinemas, theaters, libraries, universities campuses, cafes and many similar functions have the potential to be active after midnight by a considerably low electricity costs and public desire shows hints of demanding such spaces (Figure 7), however, in reality number of such functions active at night is very limited in all contexts. In case of British cities, promotions such as reduced-price restaurant meals, subsidized entry fees for galleries and extended opening hours implied as part of nightlife initiatives, however, except those events that are directly organized by city councils or similar organizations and have direct financial revenues for the city such as festivals, other functions such as art galleries, libraries and cinemas have not become an effective agent in 24-hour activity of cities. In case of Mashhad, there is only one 24/7 open library which is activelocated in shrine complex and users are limited to students of religious school (Hawzeh). One reason might be low economic revenue and lack of adequate financial supports from municipalities and city councils.

Figure 7: An example of public desire for diverse night-time activities shared on Twitter, Source: Twitter, 2019

Heath (1999) drew attention to the fact that, like all strands of the Twenty-four Hour City, policies and initiatives cannot operate in isolation. Particularly in the case of cultural initiatives, they should also operate in conjunction with urban design strategies to provide new public spaces and traffic calming and public transport initiatives to provide safe, accessible environments in which the evening economy's activities could occur.

Demant & Landolt (2013) discuss alcohol drinking culture in specific spaces of 'inner-city drinking zones' that are shaped by "production (the alcohol industry), supply (drinking establishments) and regulation (government/policy). Nightlife areas are discussed as spaces where contradictory concerns, such as (neo-) liberal interests in 24-hour sites of consumption meet health, safety and security concerns" (p.171).

They propose two terms to explain the presence of people in urban spaces in relation to drinking. The first one is 'club street drinking' which happens around bars and clubs and "drinking is an established part of night-space production," and the second is 'square street drinking,' which takes place in public areas with no night-time entertainment venues where "hanging out and drinking on the streets is more out of place" (p.172).

Parks and green spaces can play an essential role as 24-hour nodes that provide unique sensorial experiences. However, the question is, do people feel safe using this rich source of tranquility at night? Adams et al. (2007) describe parks as heaven that provides "auditory experiences that contrast starkly with the soundscape of the city, areas where ambient noise levels are low and where discreet sounds may (at least sometimes) be heard clearly." However, this heaven "can be, to the resident, both

enticing (inviting office workers at lunch, parents with young children and teenagers as a hangout spot) and repelling (affording refuge to drug dealers, drinkers, and accommodating other unsanctioned activities." (P.209) Canals can also be a sensorial refuge where smells, touch, and auditorial senses revoke. Both Manchester and London have networks of canals running through the city that residents use as a pedestrian.

2.2.2 Economic and Temporal Dimensions

"Evidence suggests that good public lighting does correlate to economic development, though the directly related returns are difficult to tease out from overall economic growth or community development" (Brätt et al., 2010, P.4). From an economic point of view, urban lighting analysis should ideally pave the way for understanding potential areas for the expansion of nighttime economies (NTEs). Also, for absorbing tourists as nightlife plays a crucial role since tourists are less involved with working hours and day/night boundaries. They are more likely to be users of night services while putting less load on the routine day function of the city. Considering the temporal dimension of urban space, the night can help to surge cities' sustainability by improving the financial input without necessarily expanding the city's footprint.

According to David Harvey (1989), the transition "from managerialism to entrepreneurialism" pushes authorities toward providing strategies to attract human resources and financial investments rather than just managing urban services. The consequence of this progress has been an expansion in methodologies pointed toward promoting cities' socio-cultural atmosphere by providing leisure activities on a 24hour basis (Bianchini, 1995). Shaw (2015) and Van Liempt et al. (2015) investigated night-time economy revival plans to convert urban night as an economic and social opportunity to revitalize in 1990s British city centers, which were partially pursued

afterward in American and Australian cities. However, further investigation by Bianchini (1995) and Giordano, E., et al.(2019, P.11) reveals, that the "initial optimism about potentialities of the night-time economy has been replaced by concerns including health risks caused by drug use and alcohol abuse as well as the increase of violence and forms of incivility."

In order to minimize conflicts of utilization of urban space and disturbance of permanent residential districts, one solution might be considering a 24/7 area that is meant to be active at night, with the restriction of giving residential permissions except for temporary accommodations such as hotels. Roberts & Turner (2005) have pointed out the struggle of residential users of Soho districts and NTEs in court cases in British cities. The 24/7 core in the case of Mashhad city is the shrine complex where sleeping is prohibited within the complex; however, in the district scale, the main functions are hotels and retails, which minimizes problematic conflicts because of the homogenous functions of the 24/7 area. Further information regarding Mashhad is available in section five.

Hence, it might be possible to state that nightlife happens with or without a specific place, time, or planning; however, urban design can conduct this force to benefit the environment, public health, and local economy. The succeeding text refers to the temporal aspect followed by social aspects of nightlife. A vital issue to be addressed is the dynamic nature of urban nightlife, which easily flows from time to time and from a place to another with changes in seasons. Night life is like a liquid gathering of people floating within the city between inner and outer spaces. It may happen inside buildings, around urban structures, and often within the border of urban man-made and natural environments. Two integrated key factors that are constructing a temporal structure of

nightlife are sleep patterns and working hours. Although sleep is considered to be the main activity during the night, a study by Boffi, Colleoni, and Greco (2015) showed fundamental differences in the perception of dwellers of different cities and different age ranges. The differences include proper sleep time and the fact that the sleeping pattern was not eight continuous hours before industrialization. People would wake up to cook, have sex, or even meet neighbors and families at night.

2.2.2.1 Working hour regulations and sleep pattern

Before investigating the connection between working hours and sleep patterns, it's important to review basic facts about sleep patterns as this information is potentially useful for any research in night studies. According to MTUS (Multinational Time Use Study, 2014), Europeans (14 years old and above) sleep 8 hours and 25 minutes on average. Based on Boffi, Colleoni, and Greco's (2015) exploration of sleep patterns, Italians sleep slightly less than the average (8 hours 17 minutes). They also point out a decrease in sleep hours to a minimum of 7 hours 55 minutes for the 46-55 age group, while for elders (over 75 years), the minimum increases to 9 hours and 16 minutes. "At 11:00 pm around 41% of the population is asleep, a figure that increases to 75% at midnight" (p. 5) (Figure 8). Two interesting pieces of evidence mentioned in this research is first the fact that "youngsters between 15-25 years of age, as expected, 59% of whom go to sleep after midnight on Saturdays" and second the decrease in leisure time of people with higher-level qualifications and professions "workers in the catering, finance, and school sectors and, in general, people with a higher education" are more likely to sleep after midnight. Sleep start time highly depends on cultural context. Although according to mentioned research, "in metropolises and cities with more than 50,000 inhabitants, the percentage of people going to sleep after midnight is significantly higher than the average" (p.6), in the case of Iran, Mashhad city's

dwellers (population: 3 million) sleep much later than residents in Tehran, capital of Iran, which is a metropolis with a higher population (9 million). (Talebian and Riza, 2020)

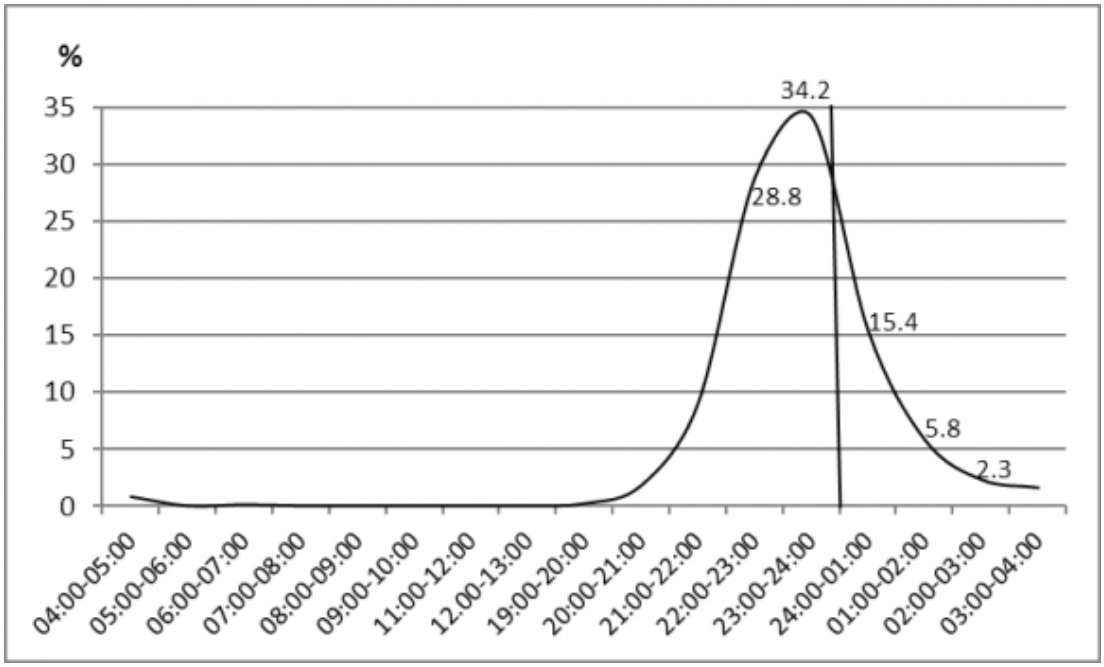


Figure 8: Average sleep start time percentages in Italy, Source: Boffi, Colleoni and Greco (2015)

An early investigation on necessity of re-considering open hours caused by flexibility of working hours on public spaces (mainly focused on city centers) is reflected on a report by Comedia (1991, P.51) where he advises authorities to move from "a nine-to-five retailing and employment centre… to an eighteen hours a day, seven days a week, economic, social and culture centre." Heath (1997, P.195) also refers to Comedia and points out early effects of flexible working hours on lifestyles in post-industrialized british cities; "part-time and shift work and even video recorder have given rise to a greater choice of evening entertainment and a different temporal demand for leisure activities."

From early investigations of Comedia and Heath in 1990s up to the time of writing this research in 2020, humankind have witnessed revolutionary changes by means of computers and global connections made by internet. Considering the fact that majority of people have computer or smart phone or both, with access to internet has bring much more flexibility to working hours compared to 20th century. This issue can be traced by emerge of online work platforms such as Upwork.com* and Freelancer.com that connect employers and employees globally. Nature of works being done include both fulltime 40hours per week and project-based jobs in which selection of working time within 24 hours is upon employees.

The year 2020 specifically hosted a critical incident that exposed the potential flexibility of working hours in the internet era. The Worldwide Corona pandemic, which forced many people to stay at home for months, made societies think of distance working more seriously. Although it took a while, finally, those dealing with distance working figured out the potential to work on a flexible timetable. (Coronavirus: How the world of work may change forever, 2021) Work, study, and many other activities that were mostly done during the day slipped into night time, and the day/night borders blurred. Also, societies depended a lot on public and semi-public spaces and were not ready to spend lots of time inside the house and small apartments that were not designed to live in but only to sleep in. Especially for more populated families in one house, night acted as “extra source of time and space” when kids are asleep and lingered works can be done. Corona pandemic also brought up the desire for being in less crowded urban spaces where social distancing would be possible to some extent. Current social distancing rules have decreased the capacity of public spaces enormously. This means a smaller number of users can use public space during the day. At the same time, distance working, which can bring time flexibility, has become

quite popular. These two forces bring up the necessity of getting benefits from a temporally dynamic utilization of public space. Public spaces can and should host even more functions to accommodate 21st century urban user's needs such as wireless internet and spaces, utilities for working with laptops, semi-private micro spaces for having online meetings and video-calls. This topic needs further investigation for possible future needs, but for sure, Covid-19 pandemic boosted semi-private and semi-public spaces over public spaces.

2.2.2.2 Opening hours

Heath (1997) discusses the effects of extension of permitted opening hours for pubs (until 12 am) and clubs (4 a.m.) on safety in 1993 in Manchester city concluding "'controlled relaxation of licensing hours can have a positive impact upon city centre crime." "The police had to deal with fewer public order and street crimes related to alcohol consumption" (Manchester City Council, 1994, p. 71). Greater Manchester Police's research indicated that crime, in general, fell by 43% and drink-related incidents fell by 16% (Stickland, 1996); during the festival period. Also, taxi firms reported, "increased trade and less aggravation" (Lovatt, 1993). These reports once more remind the temporary impact of public events on safety. According to Heath, bridging the gap between offices closing between 5 p.m. and 6 p.m. and the start of entertainment activities between 8 p.m. and 9 p.m. with the help of retail activities has been a significant concern in reviving nightlife of many British cities. In Cardiff, widening of footways to allow tables to be placed outside was part of the city council's plan to promote cafes and restaurants activities after business working hours. In Glasgow, a scheme was developed in cooperation with the Scottish Electricity Board for city centers to reduce electricity tariffs at night, allowing shop window displays to

remain fully lit at night, thereby bringing a degree of street illumination and greater store security.

In Lyon, the city's historic district (Vieux Lyon), one of Europe's most extensive Renaissance neighborhoods, is fully illuminated for years with the help of three lighting master plans (Davoudian, 2019). However, based on the author's observation in October 2017, the area was almost empty after 10.00 p.m. and seemed to be a similar situation during the cold seasons except during the festival of lights in December. The main reason seems to be the working hour of shops and supermarkets. Between 10-12:00 p.m., few mini markets with limited products were available, and after midnight finding open retail, supermarket, or any kind of eatery was very hard if not impossible.

The challenge of open hours regulations can also be traced in the case of Mashhad, where open hours regulations are flexible, allowing eateries to provide 24-hour services in the Samen district and until 2-3:00 a.m. all around the city while in Tehran restricted rule of closing time at 12:00 a.m. applies. While Mashhad has been culturally involved with 24/7 activities, Tehran's city council is in a struggle to get Police's confirmation to extend open hours. A request that has been constantly rejected because of security issues (Khabaronline. ir, 2019).

Night-time working requires higher wages than working day time. In France, salaries are up to twice as much as daytime wages. Research reveals that various extreme medical issues identified with night-time working keep it from getting typical being acceptable in long-term. Results of comprehensive research on night-time working and its effect on health, published in the American Journal of Preventive Medicine, revealed that women working long-term night shifts have a 25 percent more danger of

a cellular breakdown in the lungs than daytime workers. Another examination uncovered that male shift workers have a 65% more severe risk of type 2 diabetes. However, business entertainers are getting profoundly mindful of night-time's several opportunities. "New products and services dedicated to night-time are yet to be invented. For example, what if a post office were used as a concert hall at night time? Parks could transform into outdoor cinemas, private parking lots into residential parking for locals. Supermarkets could become coworking spaces at night time. Opportunities for innovation abound if we re-think our attitudes to time and space in cities" (Eymeri, 2020). Night-time also acts as an additional source of time for the flow of distribution of goods in the city. The rise of the Internet of Things (IoT)) can bring up the opportunity to use robots and drones for night-time delivery of goods.

2.2.3 Perceptual, Socio-Cultural and Sensorial dimensions

Looking at urban lighting through Maslow's hierarchy of needs, urban lighting has dominant effects in two contrasting areas. First, the initial effect of lighting as a fundamental infrastructure of cities to provide visibility, safety and security, social well-being, and various social opportunities for different users with different social behaviors and preferences can be traced by its reflection on users' perception and satisfaction. Second, the more we get upper in the pyramid of needs, the higher level of livability can be achieved.

According to Maslow ("Maslow's Hierarchy of Needs", extended version 2016), human needs have several stages. They have a hierarchical relation, from basic needs, including biological and physiological needs to self-actualization and transcendence. Urban lighting seems to have effects in four stages of the human needs pyramid; Safety needs, Belongingness, Cognitive needs, and Aesthetic needs.

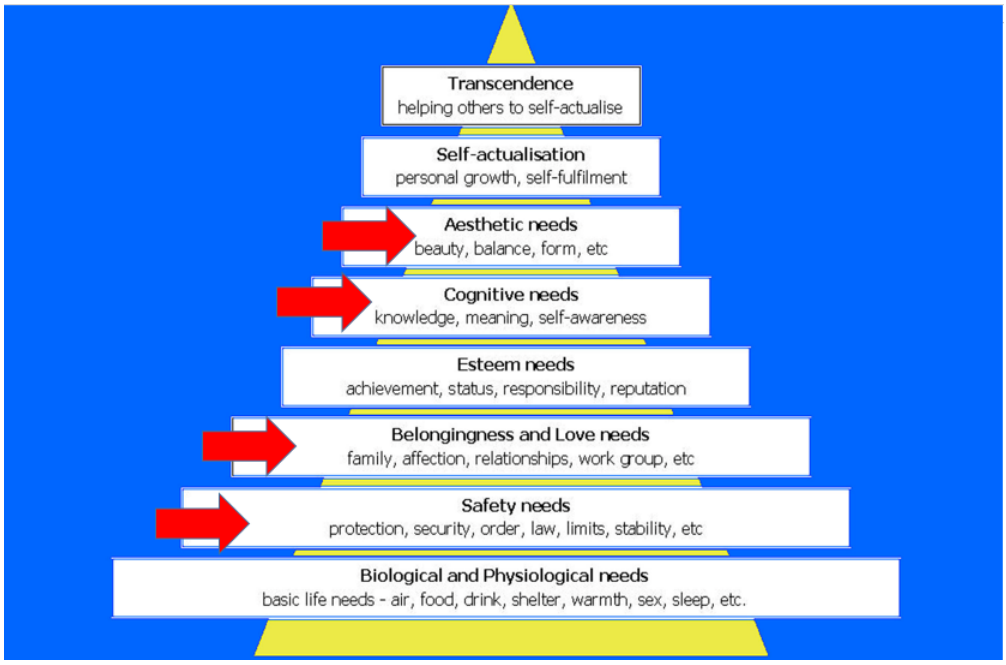


Figure 9: Area of influence of urban lighting in Maslow's pyramid of human needs. Figure by author

Heath (1998) thematized the problematic issue of giving permission only to selective functions such as alcohol-related industries in British cities. According to him, this resulted in the elimination of specific user ranges, including families, elders, and to some extent, female users. Hence he emphasizes the necessity and importance of avoiding segregation in urban spaces at night as it initially represents unequal rights to a specific portion of society and acts as a ground for further urban anomalies. Heath refers to O'Connor's (1993) point of view and concludes "that night-time activity is implicit with these functions, yet cultural policy in the UK has marginalized this part of the day, unlike in continental cities. Rather than developing its potential, the overriding objective was to control and regulate the night-time economy through safety, planning, licensing and health policy." (P.196) Subsequently, numerous organizers, strategy producers, and town focus administrators are currently conversing with another arrangement of significant parts in the downtown area around evening

time—not as controlling specialists, but rather as partners in the revitalization of Central Business Districts (CBD).

Taking a deep look into working hours, sleep patterns, authorities' policies, and weather conditions provides a hint regarding the level of night-time activities and how integrated it is in the routine life of societies. Each of the above-mentioned agents has been reviewed thoroughly in literature to make a deeper understanding of variables affecting cities' nightlife. However, it would be problematic and unnecessary to divide them in analysis of nightlife of a whole city. Instead, we would rather consider each city as an assemblage of agents that reflects it's current level of night-time activities and should add items to the list of interlocked variants and help to shape a more comprehensive knowledge of the night phase of cities.

While British cities are good examples of how segregation and restrictive regulations affect night life, the Mashhad case is an example of the dynamic interaction of ideology and economic factors that seem to be, in some cases, more powerful than imposed regulations and policies. On the other hand, Tehran, a metropolitan city with a high potential to have active urban nightlife, reveals how authorities and regulations can actually act against the public's desire through urban nightlife.

How does the sensory issues affect urban night topics? During darkness and massive reduction in levels of light, visual sensory depresses as many details become non-visible. According to Pallasma (2012), this leads to an increase in other senses. He emphasizes on the role of other senses rather than vision in experiencing urban spaces; " I confront the city with my body . . . I experience myself in the city, and the city

exists through my embodied experience. The city and my body supplement and define each other. I dwell in the city and the city dwells in me" (p. 40).

There have been growing concerns regarding the consequences of over-illuminated urban spaces and loss of darkness. Tim Edensor (2015) acknowledges the positive effects of darkness as " the potential for conviviality and intimacy to be fostered in the dark, the aesthetics and atmospherics of darkness and shadow, the possibilities for apprehending the world through other senses and the dismissal of the star-saturated sky".

Adams et al.(2007) define the city as "a domain of sensory opportunities" and "a dynamic blend of the built, the demolished, the evolving, the remembered, the sensorial, responding to and changing according to the observer" (P. 204). He points out the smell of urine, which recalls weekend mornings (p.210) in active night-time areas, and the importance of considering sensorial experiences and the inevitable conflicts of interests and side effects of active nightlife. Also (referring to Picker, 2003) how street performances that were called "A nuisance" and "a kind of bodily infection" in the Victorian period in London. Complaints were mainly from those working from home and forced Parliament to pass an act that allows residents to ask street-musicians to leave the area if their sound disturb them. He focuses on sensory dimensions of being a resident in the 24-hour city (mainly focused on London, Manchester, and Sheffield), concluding that a 24-hour city is a place rich with sensual encounters and that these are highly significant components of people's everyday urban experience while making moral directives and the assertion of power and authority leads to "a transformation of the senses, a sensory censorship." (p.205)

2.2.3.1 Safety, Fear of Crime and Defensible space

Darkness is associated with insecure feelings since it lowers visibility and consequently the ability to recognize faces and visibility. Moreover, poor lit streets create obscure spots which might be seen as possible entrapment threats for victims. Hence, safety is the most vital function and primary motive behind the development of urban lighting. Selected studies among many that have focused on the role of public lighting in reducing crimes are further studied in this section.

Painter (1996) points out two main reasons why a street could be seen as a source of threat: firstly, the absence of other people indicating that no one would reach out for help in case of a violent event. Secondly, the fact that a person walking alone is an attractive target for offenders who have company. He determines "good visibility and recognition, an abundance and varied cross-section of pedestrians" as the public's view of a safe environment (P. 194).

Perkins (1992, P.64) points out three issues associated with fear of crime; social and physical disorder, territorial functioning, and defensible space. Public drunkenness, loitering youths (those who are moving around without a specific or clear intention), and molesting behaviors can be considered as instances of social disorder while graffiti, litter (trashes, bottles, etc. left on the ground), broken light sources, and vandalism are examples of physical disorder. Territorial functioning can be described as maintenance, beautification, personalization, and symbols of protection. Finally, defensible space is seen as a situation that offers escape paths for possible victims while limits refuge (shelter) for offenders. In order to understand how lighting may affect the above-mentioned factors, we can take a look at the impact of appropriate

lighting on the perception of users. Nikuen and Korpela (2012) suggest three considerations;

1. Increasing visibility of public space especially escape paths, and excluding complete dark blind spots.

2. Changing the focus. Lighting may increase fear if it makes unpleasant things and signs of vandalism such as broken benches and graffitis more visible. (the proper focus of light also affects attention restoration, which is further reviewed in section 2.2.3.4.)

3. Being watched as a psychological effect of the Glare Effect; when an intense light reaches the visual field, it can cause a sense of being watched by an attacker or a Big Brother. The reason behind this phenomenon is the momentary blindness that lowers visual control over the environment by the 'barrier of light. Depending on the level of light and its direction, a feeling of insecurity that seems to be caused by the owner of the light source would be created.

	EDMONTON		TOWER HAMLETS		HAMMERSMITH AND FULHAM	
	Before N=207	After N=153	Before N=143	After N=143	Before N=200	After N=200
Street robbery /physical attack	5	0	2	0	1	0
Theft of/from/ damage to vehicles	12	2	5	1	0	0
Threats	4	1	11	3	1	0
TOTAL	21	3	18	4	2	0

Figure 10: Crime reduction in Edmonton, before improvements and six weeks after installation of proper lighting fixtures, table by Painter (1998)

An undeniable aspect of safety of urban public spaces at night in non-Muslim contexts is alcohol drinking and its related consequences. According to Demant & Landolt (2013), the tendency for young people to get drunk has risen in the past 20 years. In Switzerland, this has led to requests for new regulation by public health experts and politicians, and "a unit of social workers (termed SIP—security, intervention, and prevention) was employed to mediate conflicts and to promote considerate and tolerant behaviour in public spaces. This SIP unit specifically targets young people in public spaces. The unit combines social visits and the aim to keep order, but they have limited powers in comparison with the police" (P.174). Similar organizations can be seen in Iran, which is called the moral police, and 'Basij,' which have permission to give behaviour advice according to Islamic rules. However, in contrast to the "Basij," the SIP workers cannot arrest individuals or ask them for their ID.

2.2.3.2 Cultural Identity and Sense of Belonging

"Cultural identity is the identity or feeling of belonging to a group. It is part of a person's self-conception and self-perception and is related to nationality, ethnicity, religion, social class, generation, locality or any kind of social group that has its own distinct culture." (Ennaji, 2005, P.19) In this way, cultural identity can be considered both characteristic of the individual and the culturally identical group of members who share the same cultural identity. It is also noted that an individual's "cultural arena," or place where one lives, impacts the culture that that person chooses to abide by. "The surroundings, the environment, the people in these places play a factor in how one feels about the culture they wish to adopt" (Holliday, 2010, P.166).

Considering cultural identity in urban spaces without considering users would be meaningless, so to discuss it further, we need to consider the user's point of view (sociology) and physical space point of view (man-made environment). Since the main

field of the current study is architecture, our focus would be on space, and we would look toward sociology within the framework of urban space studies. The question is; Does every space has its own cultural identity? Which spaces boost the formation of shared cultural identity? Since users' perceptions are different, each would relate to a specific aspect of cultural identity based on their perception. However, the following indicators in urban spaces can act as a potential basis to form a shared cultural identity;

- Specific buildings with dominant characteristics (historic, pioneering, the tallest, iconic buildings or anything that have high potential to be remembered)
- Ornaments and motives on urban edges
- Spatial proportion and viewpoints (Naqsh-e Jahan SQ, Times SQ)
- Specific geographical features
- Specific events occurring in urban space.

What connects the man-made environment and people is Time. Time is the essential part of analyzing cultural identity because the identity of places and their meaning for users change during time, as we saw in Pruitt-Igoe housings example. Time is an essential part of providing a meaningful connection between user and space. Time together with space are the main ingredients of an event. An event is a strong node in the history of urban space which has a high potential of being recorded in our memories. So it seems that time would be an essential factor of our formula of measuring cultural identity. We may need to consider a specific time period for analyzing the cultural identity of space. For times close to the present we mostly mention the period if the event in question lingered for a reasonable period of time, but when we talk about the past, mostly periods turn to a node as well.

Lighting can emphasize existing elements, or it can be organized in a way to become an effective element itself. Brätt et al. (2010) investigated the placemaking efforts cities have undertaken using lighting while pointing out that "unsightly or ill-functioning lights can be a detriment to placemaking". They examined successful examples in North American cities, such as the use of fireworks and illuminated gas balloons at the opening of the Brooklyn Bridge in 1883, as well as the San Francisco Illumination Festival held in 1916 to celebrate the completion of the city's first ornamental street lighting system. They also mentioned the New York City's Tree of Light in 1912 and how General Electric's sponsoring illumination of Niagara Falls in 1908 turned it into a night-time touristic attraction in the summer months. They also provide a hint of how theatres' huge and bright lightings in the early 20th century helped "counter the dangerous reputation of the area around Times Square," changing the identity of Times Square. "As illuminated signs proliferated in Times Square, efforts to control them fell flat. The Broadway Association defended the signs, agreeing to a compromise in 1916 with a new city zoning law that allowed giant signs with relatively few restrictions on Broadway" (PP. 4-5).

Considering Mashhad's case, the strings of light bulbs on important dates over streets and public spaces create a specific formal appearance that helps memorize places and events. The visual characteristics of these strings are analyzed in the previous chapter as an aspect of the man-made environment. Considering the social effects of it on users, it can be stated that these strings represent a strong cultural identity of a group of people among all who have a connection or a kind of sense of belonging to the event. At the same time, it blocks out those who do not have a meaningful connection or a pleasant memory with that specific celebration. In Mashhad (in Iran generally), considering the religious orientation of authorities, festive street lightings are provided

in religious ceremonies such as the birth of Imam Reza or Profit Mohammad. The other significant event celebrated with massive street lighting is the annual ten-day celebration of the victory of the 1978 Islamic revolution. Considering above mentioned issues, three possible scenarios can be identified regarding the relation of users with these events;

1- The appealed group; those who find the whole event appealing because it emphasizes their cultural identity and boosts their sense of belonging to a vast and politically influential community.

2- The offended group; includes those who get offended from the event because it reminds them of being left out of celebration because they have had an either negative experience regarding religion itself or the revolution and current authority. For instance, one of their relatives or friends has been jailed or executed by revolutionary forces or lost their wealth and properties to current authorities.

3- The observer group; the third group is not aware of the reason behind the celebration, so it acts as an information node for them. Tourists and pilgrims mainly fall into this category. After acquiring information about the event, this group may fall under the first or second group as well.

Urban Lighting can highly impact public confidence and, therefore, a sense of belongingness. Painter (1996) points out the effect of urban lighting on increasing the sense of belongingness of dwellers, referring to the interviewer's manner on utilization of street before and after improvements. He points out that women had altered their manner toward walking that street; "They used the pavement rather than the road, walked normally rather than ran, and generally appeared more confident. "Restoration of noticeable urban elements such as parks, urban sculptures, or public landmarks boosts social activities and reduces the sense of insecurity and generally declares that

efforts have been made to improve the environment, thus creating “a more positive neighbourhood image” (P.199).

2.2.3.3 Cognitive needs: Meaning

Humankind generally gets absorbed in light, especially in dark surroundings. We gather around light as we believe it brings us safety. An illuminated object, building or public space is a signal that there is something here, some safe environment, something to see or enjoy, something that you may like, hence inviting people to come closer, to participate and discover what is going on. When there is something for the benefit of public, the light becomes meaningful, whether it is a park, a road, or a plaza. However, when the light is on private property like Donald Trump tower or any building that is not for public use, it gives a wrong signal to people to come close and participate while there is nothing there except the show of power.

In most cases, the public cannot even enter the boundary of the illuminated building, which might bring up negative concepts like segregation and frustration. Especially in societies in which there is a deep contrast between poor and rich, where night is supposed to provide recreational and restorative opportunities, lighting may become a tool to boost the differences and segregations in society and bring up negative concepts like hate, regret, etc frustration. Hence, attention needs to be paid toward selecting landmarks to be illuminated, considering the level of acceptability among the majority of city dwellers.

Gardner (2006) believes theater (multicolored) lighting, which has a specific meaning in its’ context, has been transformed into the exterior lighting of buildings and public spaces due to a lack of frameworks and guidelines. Hence exterior lighting seems odd and out of context. However, mentioned approaches can also be seen in cities like

Mashhad or Tabriz in Iran, which are not highly integrated with the theater culture. It seems that the fact that it can be applied more affects the market's preferences in the building and lighting industry. Moreover, multicolored lighting can be seen as a reflection of the multicolored architecture of the context as in the case of Mashhad. Since the concept of beauty is highly dependent on the users and local culture, a precise definition of what might be considered beautiful would be hard, if not impossible. However, light can play a substantial role in transferring a message and symbolizing an ideology; if and when this ideology belongs to a large audience in the scale of the city, it increases the sense of belonging of dwellers. Figure 11 below shows the Holy Shrine of Imam Reza in Mashhad- Iran, which provides a strong identity and meaning for the city as well as the whole country. The shrine complex is powerfully illuminated with white and yellow lights throughout the year by a specific power plant that generates the power needed for the whole complex. Even though the whole city was blacked out in 2009, the complex was fully illuminated as always and city dwellers noticed this issue.

Figure 11: Holy Shrine of Imam Reza in Mashhad- Iran provides a solid cognitive meaning for the whole city - Photo by author

One role appropriate urban lighting can play is to help the city's nightscape ~~to~~ become a meaningful composition. However, the meaning of 'meaningful' might be different

in various cultures, which highly depends on society's socio-cultural demands and backgrounds. Considering the above mentioned, each city needs to be analyzed according to the current demands and beliefs of people in order to be able to create a meaningful lighting plan. For instance, the expectation of people from urban lighting in a religious city like Mashhad, where the economy and reputation of the city is highly dependent on the existence and the appearance of the shrine of Imam Reza, would be utterly different from a city like Famagusta in Cyprus, which is an educational city. In the former case, the centrality and power of the shrine complex hold the highest priority, especially in adjacent regions. Hence, habitants, government, and the municipality of Mashhad consciously or unconsciously agree on the shrine being the most prominent parcel of the city, exaggerated and boosted by lighting. While in the Famagusta case, the city is in a considerable identity crisis after the 1974 war and deduction of the significant part of the city and becoming gated while still visible from certain points. Since the majority of Famagusta's population consists of university students, creating a focus university's achievements by the help of light and emphasis on power of education may help Famagusta boosting its new identity. In conclusion, it is quite critical to consider the meaning that needs to be aroused from the culture of context. For instance, if lighting is being used to emphasize an urban element or develop a visual language, selection of elements to be illuminated and the visual representation should match the city's identity as a religious city, a university-based city or an industrial city.

2.2.3.4 Attention Restoration Theory (A.R.T.)

Attention Restoration involves acts and/or environments that help a person get away from daily routines and restore his/her attention capacity. This raises a positive mood, thus promotes well-being. Attention capacity may get weaken after a prolonged and/or

constant mental effort. This mental fatigue's primitive signals are irritation and difficulty in concentrating. When the environment promotes the possibility of distancing a person's attention from daily routines (being away) or get their effortless attention (fascination) and supports people's intended activities (compatibility), the environment is likely to be called a restorative environment. These restorative qualities are more likely to be found in natural environments rather than urban ones (Kaplan and Kaplan 1989, Berto 2005).

There is a wide range of activities or environments that boosts attention restoration. However, this study focuses on those which can be manipulated by urban lighting. As in most cases, people have free time for recreational purposes during the dark time; the urban environment has a high potential to act as a restorative environment. One important issue regarding lighting is the focus of light which simply means which part of the environment is emphasized by putting the lights on it. The general approach is to illuminate the space that hosts the main function related to space. However, this approach may need reconsideration according to A.R.T. As an instance, in an open parking lot, there might be several elements/spaces to lit like parking space where vehicles are supposed to be parked, the boundaries like walls, fences, etc., or the soft landscape elements like trees and greeneries. Ulrich (1991) has studied the possible effects of changing the focus of light from empty spaces to soft landscape elements. The focus of light on natural content instead of urban man-made contents can provide enough illumination by reflections for the function of space which is parking the vehicles in this case while boosting attention restoration of users. Besides restoration of attention, reclamation from stress is also more expected to happen when a natural sight is in vision rather than urban environments. "Natural scenes have positive effects

on a specific cluster of emotions including sadness, fear and arousal" (Fig 13) (Ulrich et al. 1991).

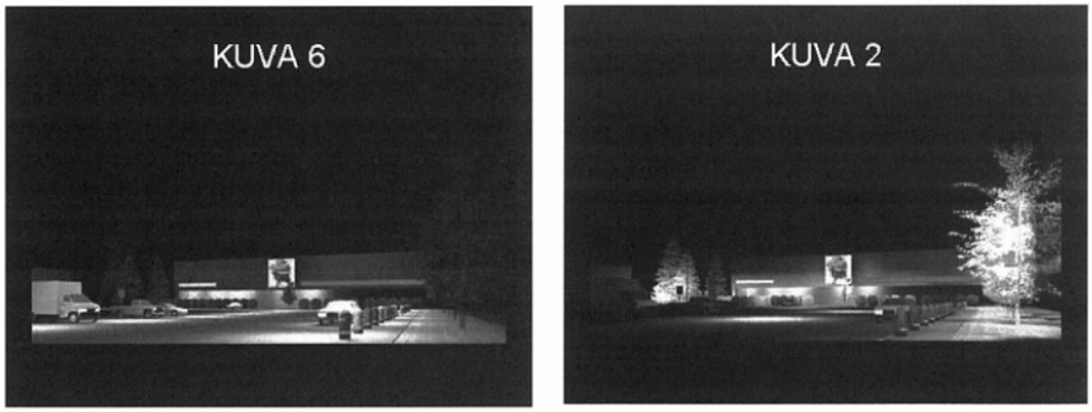


Figure 12: Changing the focus of light from pavement and empty spaces (left) to greeneries and trees (right) (Ulrich, 1991)

2.2.4 Visual Dimension

Unlike daytime, in which sunlight illuminates almost everything, visibility at night highly depends on urban lighting. Hence, form, color and target of light source have a great visual effect on users. While target of light source is discussed in the previous section, the following text is focused chiefly on the role of signs and digital screens as they were found to be an important factor in the formation of cities' nightscapes.

2.2.4.1 Augmentation and Consumable Spaces

Augmented space is defined by Manovich (2006) as "the physical space overlaid with dynamically changing information. This information is likely to be in multimedia form and is often localized for each user." Source Correlation of urban space and augmentation can be analyzed in two scales. First, from the built environment point of view, considering the effects of augmentation on urban edges and consequently on urban spaces. Second, scale is the effect of augmentation via digital devices (smart phones) and internet on users of the space. It points out possible changes in users' behavior in public spaces.

Figure 13: Organically developed signs along a pedestrian street in Tokyo (source: https://www.internationaltraveller.com)

Considering the effects of augmentation on urban edges comparing picture above (Figure 13), which belongs to a pedestrian area in Tokyo and picture below (Figure 14) which is Time Square in New York city shows two models of augmented urban spaces. One is an old district full of signs, properly scaled for reading of pedestrians; the second one is more contemporary and more involved with the scale of vehicle users. The urban edge is completely covered in both cases with signs and screens, there is absolutely no trace of architectural values behind these signs, and the urban space is hardly recognizable by the traditional definition of urban edges. The urban edge is a platform for conveying information. However, there are two main differences between these two examples; In the first one, the signs and screens are mostly containing the name of the retail with a soft graphic touch and it is static. While in the second case, the screens are not suitable for pedestrian scale and are super dynamic! The content is changing constantly and basically, its advertisement rather than the plain name of retail or service behind it.

These urban spaces are not visually harmonious considering our evaluation as architects/urban designers. Even if we exclude the emphasis on the role of designers in forming urban spaces, as we know many un-designed successful spaces have gained their credit without a specific designer behind, can we evaluate these newly formed spaces as qualified ones?

Judging from pictures it seems the first one (Fig.13) is harmonious and properly scaled, moreover it represents itself with cultural traces. While the second one (Fig.14) is only scaled for vehicles (while there is a crowd of pedestrians there as well) and its full of changing commercial images that are imposed to users' eyes and the most important; there are not much cultural clues anywhere, it can be somewhere in Japan, America or in Russia. It's a place with apparently no cultural reference rather than consumption culture as an aspect of American culture.

Figure 14: Times square - NewYork (source: www.rgbleddisplays.com)

These urban televisions as it's clear from the name (tele-vision) is meant to be seen from a reasonable distance. At the beginning urban screens were on road sides, which

provides a sufficient space between the viewer and the screen. Later they emerged at a crossroads or crowded places, making glare effect on users' vision. Finally, they took out all architectural details that could be seen from the pedestrian's point of view and covered the street façade. Can we visually memories a space with a mixture of constantly changing images? Or can we address a shop to a friend with visual information? (It seems to be challenging but needs more research on how other senses cover lack of visual references and the role of technology in place finding) The visual appearance of some essential nodes of the city is in the hands of the advertisement industry for sure, not architects nor urban designers. (Which cities and why? Newyork, Tokyo, and Shenzen, cities with high credits on commercialism and business.) It can be stated that consuming culture has produced a new generation that has 'consuming' as an indispensable part of their culture. This generation has transformed the urban space into a consuming experience. The next time one be in a space fully covered with screens, there would be definitely new images and a new visual experience. There seems to be a need to define such urban spaces with constantly changing characteristics that produce 'a space to forget' or 'consumable urban spaces.'

2.2.4.2 Urban Screens in Local Culture

As mentioned before, the recent wave of improvements in lighting technologies has brought up a wide range of colored and dynamic lighting for buildings and public spaces, which might be relatively exciting initially. These festive-like lighting approaches might positively affect people's perception as long as it is considered a short-term installation. However, there are concerns that permanent use of colored lighting may cause color fatigue which exhausts the eye's retina after a long period of exposure and create a complementary colors effect which can be seriously dangerous in vehicular paths. Even though there is no firm evidence of hazardous effects in urban

spaces as there are no focused researches; however, according to Gardner (2006), the problem generates from the fact that there is no design framework for lighting designers to deal with colored and dynamic lighting. The classical training of architectural lighting is generally limited to white light between 3000 and 5000 K, and there are no considerations for newly emerged saturated colors. “Suddenly, lighting designers have been presented with the complete visible spectrum, in every intensity, and some have simply assumed that ‘anything goes’ can be done.” (P.23). While possible side-effects of colored and dynamic lighting are needed to be under monitoring, potentials of these new visual presentations in nightscape as a .tool to add ornamentations to urban nightscape, break the monotony, and increase the chance of attention restoration by means of illuminating green spaces may not be ignored.

Figure 15 and 16 further elaborate the starting point of the transformation of urban environments. Figure 15 is the first digital screen implanted in Famagusta city- North Cyprus, around 2010. Up to 2020 eight more digital screens have been put in buildings and public spaces of this small city with approximately 40,000 dwellers. If it is going to be continued without considerations or restrictions, it is quite possible to see transformation of urban environments of Famagusta to a chaotic mixture of digital screens and festive lightings like what has happened in bigger cities.

In order to get a holistic understanding of the issue throughout history, we need to take a look back to mid 20th century when television emerged and was popularized. Scott McQuire (2006) has made a valuable investigation of the “decline of public culture and demise of public space” concerning TV screens. He points out the concern of scholars after emerging of domestic televisions. Considering how TV screens (together with emerge of suburban residences) once affected public spaces around the 60s and

now it seems that screens are back to public spaces after fifty years in larger scale as if this was public's demand. It can be stated that this is happening because people got so used to it, to feel the presence of an active contented screen, while ignoring it at the same time, just like a turned on TVs in the houses with no specific visitors.

Figure 15: Implementation of first digital screen in Anit Square - Famagusta, North Cyprus, year 2010 - starting point of inappropriate lighting, which creates visual disruption and glare effect. - Photo by author

Figure 16: Digital screens covering majority of facades in Shibuya district, Tokyo-Japan. Source:www.happytellus.co

The penetration of urban screens in historic regions seems to be slower than the speed of transformation in recently developed areas. This might result from the pressure of society against change in historic sites and visually valuable urban edges with details and ornaments that visually integrate with people passing by. However, depending on the context, this may not always be the case. In Berlin for instance, in front of Berlin Cathedral (Berliner Dom) in a very valuable historic site called 'museum island' which is a UNESCO World Heritage Site, there have been built a building in 2011 with a different architectural and visual language from a different culture (Figure 17). It seems as the building symbolically represents a non-homogenous culture. The message is clear; Samsung! One of the main producers of digital screens globally celebrates its penetration into this historic public space. The building is accompanied by a five stories long advertisement of Samsung, and its logo on two main faces is planned to be removed after the completion of construction in the building behind it in 2019. Even if the building gets removed as it was supposed to, after eight years of its existence, isn't it normal to see a huge urban digital screen in such environments? This question can be answered only throughout time. However, we can be sure that this installment, which symbolizes consumption and commercialism culture quite strong, has found its way through the the cultural identity of users of that space.

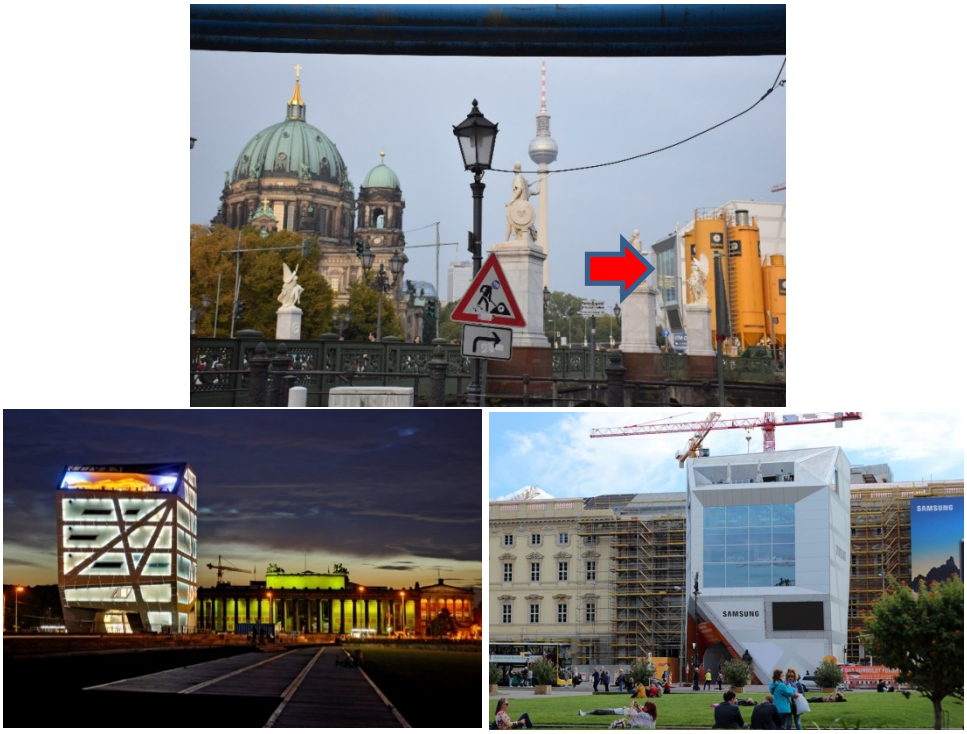


Figure 17: Screen digitals in historical sites in Berlin (photo by author, 2016)

As discussed above, different approaches have been taken in historic sites regarding digital screens. Berlin's historical sites have had a restricted approach regarding digital screens; however, Time Square in New York, which is also a valuable historic site, is completely covered by digital screens now. In the New York case, buildings are mainly built during or before the modernization period; hence, there are not many details and ornaments on pedestrian scale, and this improves the chance of evoking boredom (Parreno 2017) in space and bring up the encouragement of augmenting the space with additional layers. Another important factor is the fact that the United States is a symbol and pioneer of consumption and commercialism. TV culture, which was considered one of many reasons for the ‘fall of public realm’(source the paper) by taking people from public to private spaces to watch TV, has paved its way back to the urban public space of American cities. Also, we need to consider that Times Square represents advertisement as a dominant aspect of American cultural identity. Advertisement, which is a pillar of commercialism, has been an indispensable aspect of the cultural

identity of this space since the 1920's. There have been laws regarding size of screens since 1965, but the advertisement industry has got so powerful that can actually buy back the law by paying fine of 20 million dollars which equals 8 month rental fee of one of those screens (Gordon, 2015). This seems to be an approval of how cultural aspect affects visual and perceptual aspects of urban space… should it be discussed anywhere. A completely restricted approach can be seen in Lyon, France and Valencia, Spain. Absolutely no digital screen can be seen in the historic area of the city.

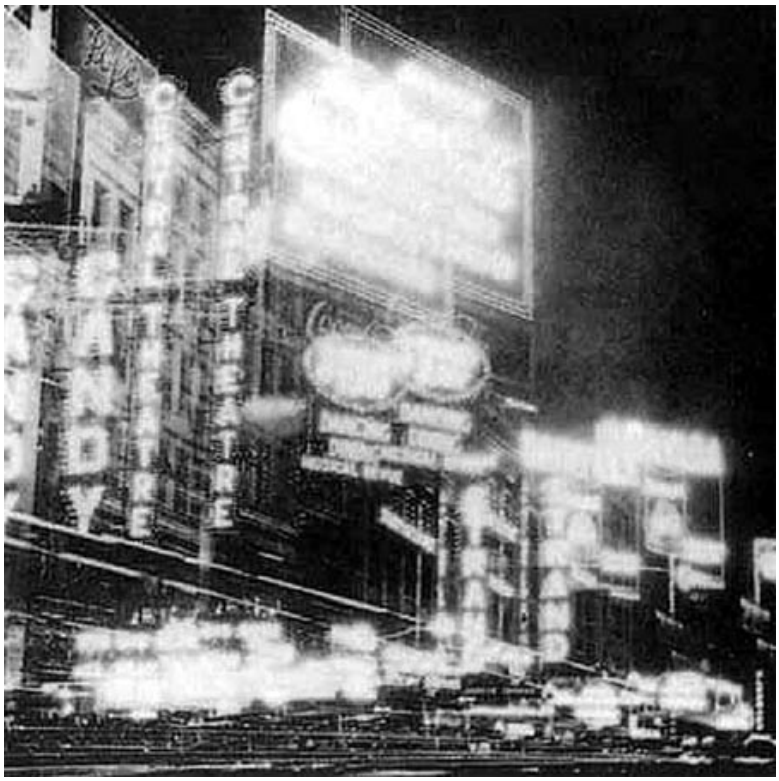


Figure 18: 1924 Photograph of Broadway, New York, 1924 Photograph Fritz Lang (Source: http://firstmonday.org/article/view/1544/1459)

Figure 19: Times Square 1927 (Source: http://firstmonday.org/article/view/1544/1459)

2.2.4.3 Mobile Technologies as Interfaces of Hybrid Spaces

Considering the effects of digital screens in our daily life, we should take into consideration our personal portable digital screens. Cell phones and laptops have changed the visual narration of our world. Given the effect of digital devices, it seems that usage time of public spaces has the potential to increase dramatically because users can handle many aspects of their lives, including work, family, entertainment, and communication. Combination of mobile internet and these devices have brought up freedom of choosing what to do in cyber-space. We can send and receive information as much as we used to in our workspaces and even more; we are in a live connection with almost everyone we know through internet-based applications. Also, we get many ~~of~~ meaning-giving pieces of information such as birth or death-related news. All in all, it can be seen that digital devices, particularly smartphones, have become an indispensable part of our everyday lives, acting like an entrance gate to the cyber space we know pretty well. These easily movable personalized spaces can be reached literally everywhere in public spaces, in a house or a stadium, and even while ~~we are~~ walking or moving by vehicle. With the help of new technologies, "architecture

becomes the site of interface between reality and virtual. Our contemporary lifestyle reliant on social media that collectively gives us the ‘circular repetitive temporal sense of time.” (Zaman, Troiani 2018). In this sense, it becomes crucial to discuss how augmentation affects public spaces and to what extent it can be considered in design and organization of public spaces.

Zaman and Troiani (2018) discuss the increasing response of architects to humans' desire “for satisfying physical and sensorial experience in a world of ever-growing excess. Pleasurable spatial engagement of the void space in-between internal and external domains requires the immediate attention of architects and urban designers” (P. 5).

As mentioned above, one major aspect of digital devices is providing accessibility. When many functions are available utilizing digital devices, a person can spend more time on a chair in a park or any public space that does not necessarily provide a function. There are many un-named micro spaces within public spaces that are perfect for having a quick look at our smart phones, which act as a movable personal space within a bigger public space. These ‘pause’ spaces could be the shadow of a tree or a seat in the bus or any micro-space that provides a reason(بهانه) to stay rather than to continue moving. In general, it can be stated that digital devices may slow down the speed of pedestrian move and bring up the necessity of new spaces that matches the requirements of digital device user pedestrians. This layer would be added to existing layers that have formed our existing urban spaces and bring up new intention of using public spaces.

2.2.4.4 Chaos as Trend, Boredom as Motivator

The example below (Figure 20) is lighting of one of a main transportation becoming a chaotic randomly colored lighting scene due to lack of proper maintenances. The reason behind such result may lay beyond political approach of new mayor as an opposition of former mayor or wrong estimations regarding the maintenance fees, or the like, however the consequence is for everyone who is in the city. This affects perception of people from proper lighting and normalizes lack of maintenance in private projects as well. A commercial building that followed the same scenario has been observed in the case of Mashhad has been further investigated in Chapter 5.6. (Figure 20).

Figure 20: Randomly colored lighting as result of lack of maintenance, Source: Author, 2012

The question is "could this kind of randomly colored lighting become a trend and finally become as a part of lighting culture?" It seems the bridge's chaotic colored lighting and similar cases has become as a part of Mashhad's lighting culture. Furthermore, investigating designed urban lighting projects, without judging it good or bad, the outcome is a multicolored lighting which is somehow similar to undesigned and chaotic examples above. It might be stated that people like multicolored lighting and do not get offended much even if it is caused by lack of maintenance.

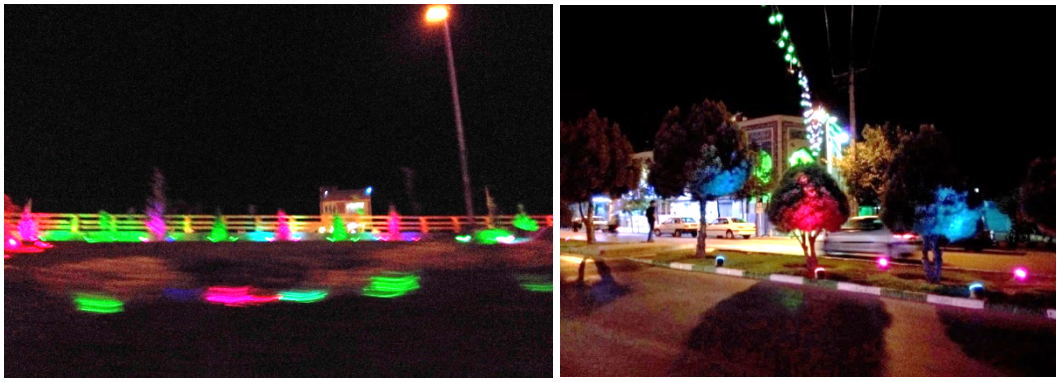


Figure 21: Urban lighting on boulevard islands by Municipality of Mashhad- Photos by author, 2016

Considering Parreno's (2017) argument regarding boredom, there seems to be a direct relation between lack of ornoments in urban spaces which causes boredom and emerge of colorfull lightings and urban screens. As an instance in Mashhad, first screens implanted on two conjunctions of Khayyam Boulevard (around 20 years ago), one of the most crowded vehicular accesses of the city. Traffic lights in these two conjunctions have the longest waiting time in the whole city (180 seconds to wait [red light] and 40 seconds to pass [green light]). In other words people spend ¾ of their time waiting and ¼ of their time passing no matter if they are pedestrians or vehicular users and which direction they are headed to. Although the screens are clearly causing glare effect they have not been removed because there is a huge advertisement profit behind it and people are getting used to watch the content in their waiting time. (regarding advertisement industries getting control over appearance of public spaces please also see text related to Times Square in section 2.4. Future of Urban Night) Picture below shows five consecutive sequences of waiting in Khayyam conjunction. As can be seen in the fifth photo ın Fig.22, the amount and intensity of light meeting the eye level is more than head lamp of the truck in picture, which is headed to camera at eye level and clearly causes glare effect.

Figure 22: Five consecutive sequences of Khayyam junction- Mashhad - Source: Author, 2012

Figure 23: Khayyam Blvd- Mashhad - Source: Author, 2012

Considering historical deveopment, urban light was concentrated in leisure activities due to high costs and maintenance fees (Koslofsky, 2002), while by improvements in technology, urban lighting have become an indispensible part of city. By increasing time of usage of urban spaces, emerge of boredom as consequetive result has become inevitable. As a result we can see emerge of different lights from different agents and

they all together act as ornaments of night face of the space. This can be crosschecked by emerge of static advertisements and later digital screens on junctions and on road sides where the waiting time behind traffic light or the waiting time before reaching the destination creates the boredom for night-time users of spaces. Although these digital screens in almost all cases create glare effect they have not been removed or modified in more than 20 years, because people prefer to see something even advertisement than nothing. The lack of ornaments and details in urban spaces together with extended usage time is the perfect condition for emerge of advertisement and ornamental urban lighting. As result we can see decorative, colored and even dynamic lights in some cases on the facades of buildings and other urban surfaces that are not necessarily representing the daytime characters of buildings/spaces, but an exaggerated, surrealistic version of it. We may call these elements as 'night-time ornaments' of city, to be seen by both pedestrian and vehicle users, but actually more appropriate for point of view of vehicle users or pedestrians from a reasonable distance.

Figure 24: Different representations in day and night- the main entrance of Ferdowsi State University -Mashhad, Source: author, 2018

The urban night is mostly under control of the private sector. Lack of power, rules, and ideas in municipalities have left the competition open for the private sector. They boast

as much as possible to attract attention on their screens, buildings, signs, or whatever can be seen by the public. Mashhad is considered to be a pole in the banking industry in Iran. Pictures below partially reflect the competition that is going on between banks in nights. The irony here is the fact that there have been quiet numbers of bankrupted banks in recent years that have had difficulties to pay back original money people.

An interesting case is the oldest banks of Mashhad; “Bank-e Melli” which is considered as one of the indicators of modern architecture in Pahlavid period, not so far from Holly Shrine complex. Picture below highlights different sequences that a building can host according to national events. While one scenario is in line with the daytime character of building, the other one is completely festive and overcrowded which is only to be used in special days and events.

Figure 25: Different characters of Melli Bank, an iconic example of modern architecture in Mashhad. Source: bank's official website

2.2.4.5 Future of Urban Night in Futuristic Art-works

Our tool to monitor public's desire for future of urban night is the Media. Media refers to a broad concept nowadays which is consisted of internet based social medias, TV and film industry. Among these film industry is an important reflection of society's desires and expectations of future. Movies creates and in some cases forecasts atmospheres of future cities and transfers it to collective memory of considerable number of people within a generation. However, we need to consider that these visualizations of future cities are designed to accomplish movie's atmosphere and is not supposed to be completely realistic and moreover these scenes are designed by an artist or group of artists oriented to same direction while urban space will get shaped by many agents and desires that do not necessarily follow same direction and are even in contradictions with each other most of the times, so realized version of visualizations in movies are always more chaotic than it appears in movies because many issues that were not in the scope of film's scenario interfere and affect in reality.

Stathi & Paissidis have taken a look into transformation of cinematic nightscapes into urban contexts. (Stathi & Paissidis 2006) Their investigation is mainly focused on aesthetical aspect of night scenes in some of the most well-known classic movies. Although compositions and considerations of lighting a movie scene can be considered as early visualization of designed lighting composition, there are two main issues can pointed out in this research;

First, authors refer to very old movies that were part of collective memory of previous generation who are more than sixty five years old in 2021. These movies were desire and expectations of people at that specific time (1940-1960). Although they might still be popular within a context, their affective lifetime on the majority of people has come to an end. Many cities have already passed that stage and entered to a new stage that

deals with LEDs, digitalism, and colored lightings. Second, the main reasons behind the formation of the city's nightscapes are functional applications of artificial light rather than aesthetical use. Cities need to have a proper lighting which requires considering many issues including visibility, crime, light trespass and environmental issues. Urban lighting needs to meet functional requirements first, which will automatically enhance the beauty of nightscapes as well, and focus on aesthetical aspects afterward.

Another issue to be considered is that the notion of city is highly associated with motion which is in deep contrast with stable notion of camera which records a single and stable point of view. However, this approach of cinema have also changed in modern cinema, we can see views close to point of view of a driver in a highway for instance, which to some extent illustrates real point of view of a person driving in that highway. Although this may seem to reduce the gap between cinematic and real experiences still movies cannot act as a good reference to design urban lighting, it can only act as a reference to see people's desire for future developments.

One comprehensive example of futuristic movie which has a special focus on the night or 'The Dark' as it's defined in the 1982 film: 'Blade Runner, 2019' and its sequel; 'Blade Runner 2049'. In the 1980 film, futuristic image of Los Angeles city predicts urban facades covered with digital screens. This prediction almost became true except in a more chaotic way. Digital screens of buildings' facades cover urban spaces in almost all metropolis cities like Times Square in New York and Shibuya district in Tokyo, but it is not as it was shown in the movie. The urban scene is made of parcels of digital screens that are not in harmony with each other and are not isolated in the

dark surrounding like a visual work in an exhibition as it was treated in the movie. Its chaotic and confusing, and their content and color are constantly changing.

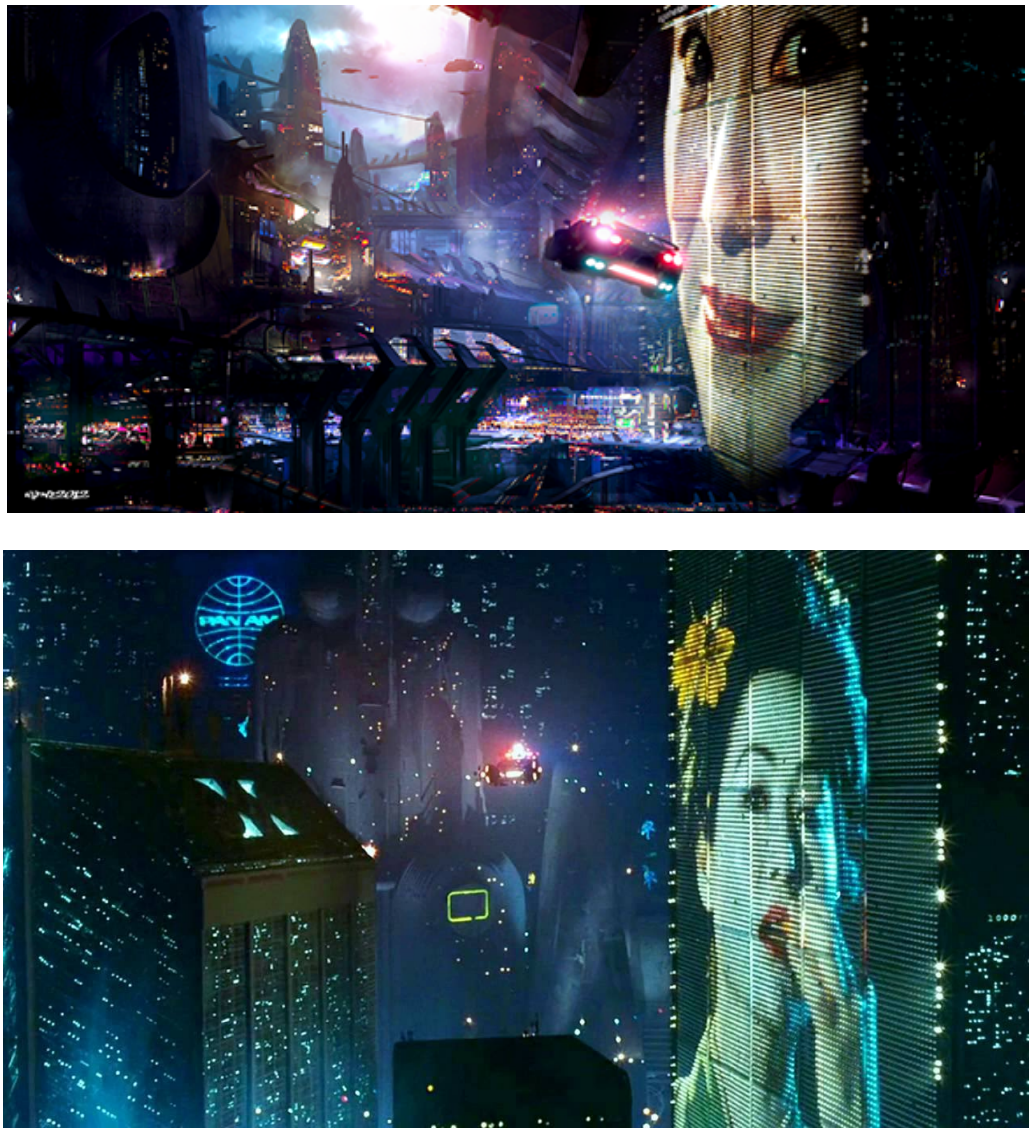


Figure 26: Digital screens on urban facades from the movie Blade Runner, 2019 produced in 1982

Comparing contradictions between scenes design by visual artist and reality of mixed commercial tastes that actually will shape the urban facades. Comparing LosAngeles in blade runner with it's current condition reveals some of possible contradictions between expression in media medium and reality. One clear difference is that city is

not really vertically active as it is shown in the movie, however, transformation of advertisement billboards into digital screens is notable.

Figure 27: Real photos of LosAngeles city in 2019 (Aurf, 2014)

In the 2017 film: ‘Blade Runner 2049’ which fictionally pictures the same city in 2049 there are again strong traces of advertisements technology. This time it seems holograms that make a three dimensional objects by light will be used in public spaces. It seems realistic since the technology is available now and is been used in concerts and other instances, but only passage of time will show how and to what extent it would be used. What can be stated for now is that virtual reality will be an indispensible component of future urban night for sure. 3d mapping that are being used in lighting festivals worldwide and holograms are not emitting light on what is already there, but they create a dynamic manipulated image that may transform the night face of urban space to something unrecognizable compared to daytime image of space.

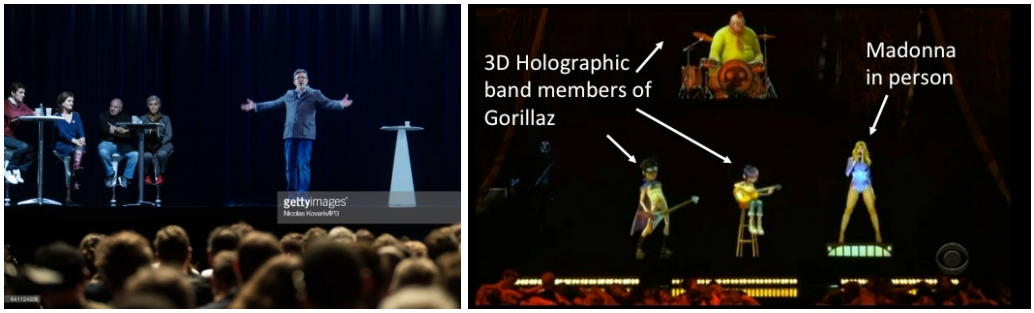


Figure 28: Current uses of 3D hologram in a political election campaign and a concert

Figure 29: 3D holograms as pictured in Blade Runner 2 referring to Losangeles city in 2049

Figure 30: Future of Tokyo city pictures in Akira anime as Neo Tokyo

2.3 Cities of Lights and Reflection of Culture in Urban Nightscape

There is an abstract concept for cities which are in a way related to light in their culture. “City of Lights” is the term to refer to such cities. Paris, Lyon, Eindhoven, Cairo, Bombai and Las Vegas are some examples, however, not all of them are necessarily a 24/7 city. In this section three international three examples that are observed by author are examined and possible relations between the culture of cities and reflection of it on the urban lighting is investigated.

2.3.1 International Examples

2.3.1.1 Paris

A well-known example of a city known as city of lights is Paris. The initial reason relies on the fact that Louis XIV initiated rules in order to make the city safer on 1667. In addition to increasing the number of polices dramatically, many lanterns were installed on streets. Residents were asked to light their windows with oil lamps and candles to reduce dark spots for potential criminal activities. Later on, also the first permanently illuminated streetlamps by electricity in Europe were installed in Paris in 1889. Although this issue coined the nickname City of Lights (La Ville-Lumière), one cannot ignore the impact of high reputable nightlife and landmarks such as the world-famous Moulin Rouge cabaret, Eifel tower, Champs-Elysees boulevard and more than 300 illuminated sites including 33 bridges in success of city to remain the most well-known city of lights. (source: https://www.expedia.co.uk/explore/why-is-paris-called-the-city-of-light)

Figure 31: Paris night view from space- Source: NASA's Black Marble, 2016

2.3.1.2 Lyon

Second example id the city Lyon, also in France , which is of great importance for the current study because of the similarities between this city and the case study of this research. Comparing two cities, both are known as City of Light(s), from different cultures, may reveal more clues regarding the reflection of culture in urban lighting. Lyon and Mashhad are both the second largest cities in France and Iran. Both are populated around 3 million dwellers. In Lyon's case the term is; City of Lights and it refers to revival of lighting festival in 90s to recreate a new identity for industrialized atmosphere of the city.

In the case of Lyon, although there have been many studies concentrating on the transformation of Lyon from an industrial city to a branded city and how it has become a city of interest for cultural tourist, the main character and image of the city is still shaped by its past as an industrial city. It can be stated that Lyon can be considered as city of lights but definitely not a 24/7 city. Except for the short period of the yearly festival of lights and perhaps a month before and after that, the city is not an attractive tourist destination for the rest of the year. Partly because being attractive to tourists was never a goal for Lyon dwellers, their economy is not based on it, and they are culturally not involved with such a concept. It can be stated that “revival of lighting festival” have been injected to the city to get rid of dullness of urban spaces and it did to some extent but the impact seems to be temporary, limited to period of lighting festival. Some possible reasons are identified below regarding why culture of city does not conform being a touristic attraction. The city interestingly reflects its own identity which is integrated with industrialism, it can be seen in historical region and newly developed areas, even in nightscape of city. (Figure 32) Formality and order is an undeniable aspect of Lyon’s culture. This is also reflected in order and arrangement of

urban lighting elements. Selection of light sources also confirms above mentioned arguments, as there are very limited colored lighting and illumination is mainly done by variants of cool-white, warm-white and yellow colors. Unlike lighting in Mashhad in which using colored light sources has become a reasonable trend in urban lighting. Working hours of markets and transportation in Lyon are limited, contrasting with the concept of a 24/7 cities. Shops close at 8 p.m. and supermarkets close at 12 a.m. in main touristic area. In Mashhad around the shrine which is also main target of religious tourism restaurants, shops and supermarkets are literally open 24 hours. Another issue is the fact that in Lyon non-French speaking visitors may face serious difficulties in providing their needs and communicating with city dwellers including people in public services. Although the language barrier may be a common issue in many travel destinations, in contexts that are economically dependent to tourism, locals are more enthusiastic to communicate with foreigners even with a broken and mixed language. Since Lyon's economy is not dependent to tourism locals are not in favor of putting extra effort to communicate which may cause feeling insecurity and make the city culturally un-readable for visitors.

Figure 32: Daytime and nighttime character of Lyon both represent formality, repetition and order, common characteristics of an industrial city. Pictures by author, 2017

2.3.1.3 Eindhoven

Eindhoven city in Netherlands almost has a same history. It was an industrial city and it holds annual lighting festivals in November. Eindhoven is also branded as city of lights, but the difference is that there is a symbolic history behind foundation of Philips Company which was one of pioneer companies in manufacturing electric lamps.

Figure 33: Philips Headquarter and St. Catherine's Church during Eindhoven's Glow festival of light, Source: https://qrealinvest.com/portfolio/eindhoven/ , 2020

The trend of branding night phase of cities is getting more popular in European cities partially due to blurred border of countries which has transferred the competition to absorb tourists and investments between countries into the scale of cities. According to Straw (2013): “In Ireland, the cities of Cork and Dublin announced plans to extend and promote late-night openings for art galleries and museums, in an effort to improve the quality of each city’s downtown nightlife. The newly-appointed “Night Mayor” of Prague, Jan Štern, struggled to balance the city’s reputation as a tourist party destination with a rise in complaints from downtown residents about night-time noise. Inhabitants of the English city of Liverpool, according to a new survey, claimed they felt more and more safe going out at night, and gave partial credit for this to an alcohol industry campaign against excessive drinking.” (Will Straw, 2018) (P. 33)

2.3.2 Lighting Culture and Repeated Patterns

An indispensible pillar of night is light. Whenever an investigation is pursued in the field of night studies, a boundary is defined or imagined by the help of light. Especially when urban space and night-time activities are taken into consideration, lighting condition becomes a communicative medium, providing information about the nature, size and length of containing activity. But the light may not bear the same meaning among different cultures. Weather condition, ideological and cultural background of society and financial power and intention of city governors are identified as three essential agents in formation of a ‘lighting culture’ that shapes and visualizes the night phase of cities.

Defining regional culture with quantitative factors seems to be hard and more over inappropriate approach. Instead, culture can be narrated through a descriptive text. Length of this text highly depends on depth of knowledge of narrator from that specific culture, none of the population or geographical condition affects the length of

describing text. Simply said; the more one person has actively and integrated lived in a society, the more one can describe the regional culture, although careful observation may accelerate this process, but still there is always a need to get information from locals who've lived in the region for a long time. This process of documentation can definitely get richer by use of documented materials if available, including texts and visuals. So it can be stated that definition of culture is partially dependent on narrator and it varies considering the context of research. In order to narrow the focus on culture and describe regional culture within context of this study, following questions needs to be answered;

- What do people do in this region? How do they earn money for living?
- How do they spend the money?
- What kind of belief system is believed in the society? Is there a specific religion(s) to point out?and to what extent people are dedicated to that ideology/religion?
- How people express themselves within the society?
- Is there a specific thing/event that people of his region are known for?
- What is the weather condition? Is it extreme in any aspect? Is there a evidence of weather condition affecting dweller's behavior and mood?

The World Cultural Report defines culture as "the ways of living as individuals and ways of living together." (UNESCO, 1998) Tylor defines Culture as ''knowledge, belief, art, moral, laws, custom, and any other capabilities and habits acquired by man as a member of the society''. (Tylor, E. B. 1974.) Lewis Mumford (1970) considers culture as the fourth pillar of sustainability (in addition to environmental, social and economic) in his book The Culture of Cities. Clearly many factors are involved in formation of a culture and culture itself has many subcategories. Considering these

definitions it can be stated that illuminating the living space (lighting) is a part of "customs" or the "ways of living" so it is included in the notion of Culture. The one we are trying to define here is 'Culture of Lighting' or 'Lighting Culture' which is a collection of local's behavior concerning light. Stathi & Passidis (2006) define nocturnal culture as "a broad conception of what we ultimately expect from our visual experience at night." In order to be able to consider a factor as a variable of lighting culture, we need to find repetitive acts regarding using daylighting and artificial lighting. These acts may or may not be a part of local tradition.

There are different patterns of using light in rituals, ceremonies, etc. that have been repeated long enough to be transferred to next generations and are still in use and popular. Some of these patterns in the context of Mashhad is discussed below. An example of a remained pattern could be lighting pattern which is still in use in national holidays or special days. This method has been used more or less with the same language for more than fifty years. (Fig 33) There are also patterns that are getting vanished for different reasons. For instance, there are restaurants that serve a specific Persian food (Chelo Kabab), a widely popular food in Iran. In the past, this food was mostly served in special days like formal ceremonies or funerals and was also quite popular in society's middle and upper middle classes. Restaurants that were serving this food would light a green light in front of their restaurant, showing that this restaurant serves this specific food. This lighting pattern is disappearing since 'Chelo Kabab' does not belong to a specific class of people anymore and almost every restaurant has it in their menu.

Another example is using white and blue fluorescents in nomadic buildings that are under-construction. Mostly these combination is used in buildings that are built by

contribution of clients during the construction. These lights transfers a promotional message to potential buyers and invites them to invest in the process and own the house in few years.

Figure 34: Forming a shape by Strings of light bulbs in urban spaces- (Fars News, 2011)

2.3.3 Nightlife and Conflict of Interests

Un-rest as opposed to primary function of night for resting is an un-detachable aspect of any form of nightlife. Whether the situation is made by choice or force, night activities can act as a refuge from daytime pressures or become a source of pressure and discomfort for those affected by others' night activities. This issue mostly becomes critical in mixed-use areas where residential blocks and night time economies co-exist together. In many cases depending on power of stakeholders or supportive regulations of municipalities for residents, one of encountering forces win over the time and the border of encounters move to new fronts.

Research conducted by Maalouf and Ghadban (2015) on socio-cultural impacts of nightlife tourism on host communities of Gemmayzeh district in Beirut, Lebanon points out some of such contradictories. For instance, most residents (90%) of mentioned district work outside that area in the Lebanese public and private sector, hence, are not benefiting from tourism and are not contributing to the development of the local economy. Leaving the area to be controlled by foreign investors. While the rapid growth of mass tourism in Lebanon and the unplanned tourism projects has resulted in following negative impacts in the area:

- "The identity and well being of local residents was affected by the lack of tourism projects aiming at conserving the heritage and traditional character of the region.
- Noise pollution caused by loud music until early hours of the morning, the unavailable parking spaces, and the waste left behind by visitors.
- Some of the local residents have left the area as a result of the increasing tensions between the local residents, foreign visitors and bar owners."

As a result, the local residents took many initiatives including demonstrations, protests, participating in TV programs and complaints for the Lebanese government and the municipality of Beirut as well as the many attempt to protect the historical buildings from being deteriorated for tourism purposes while at the same time proposing participation in tourism planning and management. (El Maalouf & Ghadban, 2015) A law was inacted finally that forbids activity of bars in residential buildings also close to schools and defines minimum of 40 meters between one to another, however, these rules were never implanted in reality since the number of bars are far above applicable measurements. Gemmayzeh example shows necessity of involvement of locals in

nightlife tourism and the fact that younger residents are more likely to comply with nightlife tourism in their neighborhood.

Alcohol consumption and related anti-social behavior have become a critical concern in the night-time management of public spaces in the Western context. Robert and Turner (2005) called attention to the depression of desire of any social group, other than youth, to go into city centers at night. Roberts (2006) emphasized alcohol-related disorders caused by related night-time economies and how the 'binge drinking' habit and how 'binge drinking' habbit and creation of 'no-go areas' have made British town centers out of control. Eldridge (2010) pointed out the contrasts between a desirable, safe, and comfortable city center at night and alcohol-related problems such as violence, fear of crime, and public urination. Meanwhile, the study by Valentine, Holloway, and Jayne (2010) pointed out the exclusion of Muslim youth from the night-time economies of some city centers due to their culture's abstinence from alcohol. Finally, Liempt, Aalst, and Schwanen (2014) concluded that "Discourses of disorder, anti-social behavior and the 'alcoholisation' of urban nightlife constitute a danger for any city that wishes to appear as an innovative, exciting, creative and safe place in which to live, visit, play and consume."

> "night-time public spaces remain contested arenas with radically different meanings for night-consumers, leisure businesses, police, public health agencies, local residents, night workers, voluntary agencies and local government" (Crawford and Flint, 2009. p. 407).

2.3.4 Reading the City by Night Imageries

Two releases of night images of earth by NASA called Black Marble has opened new gates for reading cities morphology, their growth patterns and more. An instance below clarifies destructive effects of wars imposed to Syria and Iraq and its effects on

civilization in two photos, one taken in 2012 before wars and second one in 2016 when wars are started. ("Night Lights Change in the Middle East", 2016) As can be seen in 2016 image, cities such as Aleppo, Damascus and Mosul are almost vanished away while other cities around, even those in other countries, have grown as if those people have moved to neighbor cities where living conditions were better.

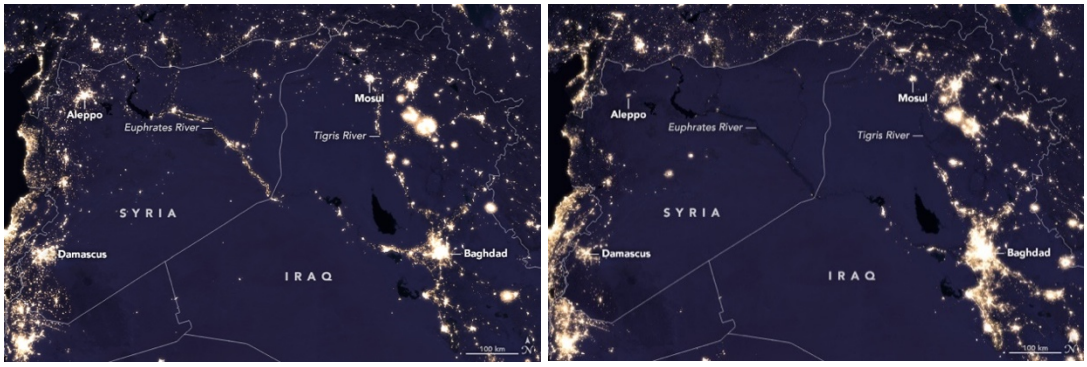


Figure 35: Effects of war in Syria and Iraq, Left 2012, Right 2016- Source; NASA's Black marble- 2016

Another example of receiving information that was not so easy to access before is the night view of Tokyo. While professionals in Tokyo might be aware, others around the world could only know by this map that mercury vapor street-lamps are mainly used in this city which produces blue-green color as opposed to sodium vapor lighting, which is mainly used in the rest of the world and produces an orange-yellow light. A comparison to night-time image of Phoenix city in United States is provided which reveals much of lighting system as well as gridal urban tissue.

Figure 36: Differences on street lighting system and urban tissues are visible. Left: Tokyo, Right: Pheonix, Source: NASA's Black Marble, 2016

In figure 36 London and its suburbs are visible which is taken from the International Space Station. Two of the characteristics that stand out at night are the progressively denser concentrations of lights and the change from yellower to whiter lights as we get closer to central busines districts (CBDs) that are known to had night-time revitalization plans. Also major dark open spaces which are parks, golf courses, cemeteries and college campuses.

Figure 37: London's night map reveals dark areas which are essential for wild life preservation as well as CBDs night-time revitalization project areas, Source: NASA’s Black Marble, 2016

2.4 Summary of Chapter

Many researches have been done in the field of urban lighting, especially in the period of 2010-2016 by expansion of use of LED lights. Nobel Prize of Physics in 2014 went to Shuji Nakamura, Isamu Akasaki and Hiroshi Amano for their contribution which led to manufacture of white LEDs (via blue LEDs), and United Nations announced 2015 as “Year of Light”. “Red and green diodes had been around for several years, but adding blue diodes allowed a mix that could produce practical white-light LED bulbs.” (C. Nunez, 2014) The importance of invention of blue LEDs is that LED lighting equipment which utilize with a very low electricity usage flooded in the market and flourished in exterior lighting of buildings (Hotels, Commercial and Residential complexes, and even apartments) and later in public spaces such as parks, pedestrian paths and urban monuments. The table below (Table 3) is a compact representation of literature on urban lighting. Five main categories could be identified, which are reflected as vertical columns in the table. Left columns are more related to livability concept while going toward right subjects are more related top sustainability which is more explained in chapter three. Scholars referring to these subjects are ordered by year of publication as rows. Plus signs (+) shows topic was not the main focus of research but there were secondary relations.

Table 3: Urban Lighting in Literature

	Five main fields of research in urban lighting literature				
	Social and Cultural	**Aesthetical, Visual, City Image and Perception**	**Health and Comfort**	**Policy, Decision-making & Planning, Economy**	**Energy usage, Natural environment, Light pollution, Sky glow, Impact on immigrant birds,**
Scholars					
Alain Guilhot (1989) via K.M. Zielinska-Dabrowska (2019) Davoudian (2019)		City beautification by light- Horizontal and vertical illuminance with different color temperature to enhance routes, historic buildings, monuments and public spaces	Effects of light on human health	Lyon's first lighting master plan	Reduce Light Pollution from Media Architecture and Non-Static, Self-Luminous LED Displays for Mixed-Use Urban Developments Sustainability
Ulrich (1991)		Urban lighting reduces fear	Sadness and arousal,		
Painter 1996, (Also with Farrington in 2015)		Perception of safe place	Fear, Crime, Stress and Sadness		
Tim Heath (1997)	Revitalizing urban space by night time economies			Night time economies plans in British CBDs	
David Nasaw, 1999	Going out and evolution of night culture, Lights made city safer and cheaper.	Light marked the city as a sight worthy of respect, even admiration.		+	
Paul Chatterton, Robert Hollands, (2003)	Youth culture, fun and disorder, Consuming Urban Nightscapes, Sexism in night; Young women and gay cultures		+	branding and marketing, urban entertainment economy	
An-Seop Choi et al. (2006)	Syntax and Space use			pattern relation between Spatial integration and lighting standards	
C. Bianchi et al. (2006)		Uniformity of color, Warm colors			Pollution, Transition zones
C. van Santen (2006)		Beautification of city		Light planning in urban context	Effects of light pollution on sky glow and i9mmigrant birds
E. Bordonaro, C. Aghemo (2006)	History of "Lived City"		Safety		
S. Serefhanoglu (2006)	Aesthetic requirements in Urban scale	User's opinion	Illumination levels lm/m2		
Gardner (2006)			Psychological effects of colored and dynamic lighting, Meaning		
Vassileva, H. Kollhof 2006	Identity	Space pereception- Functional lighting as a factor in formation of city image			
Adams et al. (2007)	Conflict of interests of users and dwellers- Diversity of activities and mixed-use developments on 24/7 areas	Sensorial Experiences in 24/7 areas	Maxmising positive sensorial characteristics of nighttime active areas		
N.K.Park &C.A.Farr (2007)	Cultural background affecting approach-avoid intention,	Color rendering index			

McQuire, 2008	+	illumination has produced a “new ‘map’ of the city”			
Tim Edensor, 2012, Urban Studies	Challenging Excessive Illumination and Revaluing the Dark	relationship between light and dark	Urban darkness and provoke of other senses	lighting the urban night in ways that honour darkness	Light pollution, subtle forms of illumination; semi-dark and gloomy spaces, developing festive events and growing night time economy is accompanied by increasing concerns to develop sustainable lighting
Nikuen and Korpela (2012)		Visibility Focus	Attention Restoration, effect of changing focus of light		
Unver A. (2012)				Lighting master plan	
Demant & Landolt (2013)	Alcohol drinking culture in ‘inner-city drinking zones’		Nightlife areas as contradictory spaces concerns, liberal interests in 24-hour sites of consumption in contrast with health, safety and security concerns	Alcohol industry and establishments and regulation (government/policy)	
R. Shaw- (2013), Durham University	+			Night-time economy, Assemblage, Affective atmospheres	
Ben Gallan 2013 – Urban Studies	Night culture, cultural infrastructure				
Josiane Meier, Ute Hasenöhrl, Katharina Krause, Merle Pottharst, (2014) book: Urban Lighting, Light Pollution and Society 2014, Routledge	Sense of Place and Convivial Atmospheres	+		The Rich Potentialities of Light Festivals	Light pollution
Ilse van Liempt, Irina van Aalst, 2015, Urban studies, -Utrecht University	changing meanings and experiences of urban darkness and nights			Evolution of the night-time economy, intensification of regulation	
Will Straw (2015)		Media and the organization of time			
Boffi, Colleoni and Greco (2015)	Sleep pattern in different Italian cities		+		
Giordano, E., et al.(2019)	Alcohol consumption in urban spaces in Mediterranean nightlife model	Safety- night-time recreational activities have also generated conflicts		Review of British cities’ nighttime revitalization plans	

While the number of research done in technology and the use of light is relatively high, few have focused on the psychological and sociological effects of urban lighting. As a result psychologists, sociologists and even designers are far behind the pace of technology of lighting and consequently we see chaotic night images of cities caused by; 1- Unplanned and uncontrollable massive use of colored and dynamic lighting 2- Unplanned and massive use of digital screens and 3- Lack of specific adopted framework to evaluate lighting quality considering current usage of devices and technologies and last but not least; 4- Shortage on interdisciplinary collaborative research including fields of geography, anthropology and sociology together with urban design and planning.

The primary solution for the above-mentioned problems is the lighting master plan, which should ideally be a framework to rule, control, and evaluate urban lighting. However, in reality, considering all urban lighting related issues in one project as a master plan cannot get into practical details and solutions in smaller scale rather than the whole city. So interdisciplinary cooperation needs to be done in the scale of region and neighborhood in regional urban lighting projects that include economic, social, psychological and cultural issues.

Mixed-use blocks with both residential blocks and 24-hour functions should be avoided as much as possible. In the neighborhood scale, this can be solved by allocating the 24-hour functions around public spaces and community buildings that are not active at night with a reasonable distance from the residential blocks. In the scale of city designated 24-hour districts on business districts or retail areas that do not contain residential functions can help maintain nightlife without conflicts with residential functions. In cases that the force of 24-hour economies are strong this may

happen naturally even without prior planning of authorities, leaving behind negative impacts for those who had to leave the area and consequently decreasing the livability indicators of those district.

Chapter 3

LIVABILITY

3.1 Introduction and Definitions

With more than half of the world's population living in urban areas in 2011 from about 30% in 1950, it is projected that the urban areas in the world will host almost 70% of the world's population by 2050. As the United Nations (2011) notes, such increasing urban concentration in very large cities is a relatively new phenomenon that the world is experiencing which also highlights the growing need to investigate the quality of living in such cities. "Urban livability suggests that there is an ideal relationship between the urban environment and the social life it sustains" (Hankin and Powers, 2009). Oktay (2012) defines "the state of social wellbeing of an individual or a group" as quality of life, emphasizing on satisfaction that a person gets from surrounding human and physical conditions. The term "quality of life" has also been used in earlier studies. (Altman 1975).

There are many definitions and explanations around the subject of livability in academic and non-academic atmosphere. Efforts have been made in this study to gather most prominent and cited definitions around the subject and main common key factors are extracted to be able to investigate possible relations of urban lighting on livability. Below various definitions of livability throughout the time have been analyzed. Definitions and key factors of livability are collected at the end of this section in Table 5.

One of the early definitions of livability can be found in Newman's (1999) research on sustainability and cities. He has considered city as a biological system that can be observed through sources input, the metabolism and the outputs in an 'Extended Metabolism Model of the City'.

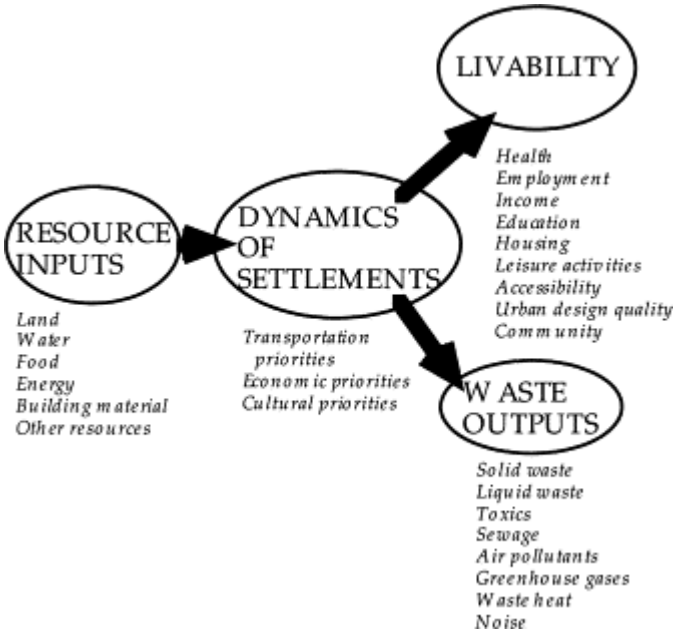


Figure 38: Livability by Newman's definition has inevitable waste output (1999)

From Newman's point of view, livability is the positive outcome of all resource inputs and there is a negative output alongside livability, which is waste. In other words, waste output is the cost of providing livability. So, firstly we should know that livability is basically a very valuable and costly product. Secondly; "it is not possible to recycle [the waste] any further without enormous energy inputs that in themselves have associated wastes" and "the best way to ensure that there are reductions in impact, is to reduce the resource inputs." (Newman 1999)

Mostly above negative outputs affect sustainability while they are inevitable outcome of livability. This brings up the necessity to analyze sustainability and livability

parallel to each other but separately. These two concepts are not same and should not be measured an analyzed in a single process. However, achieving higher level of livability with lower level of waste output would benefit sustainability. These two concepts are highly quoted in literature related to urban studies, hence, following section is provided to clarify the standing point of current research.

3.2 Livability VS Sustainability

Although sustainability and livability have strong connections and support each other in general, we need to consider that in reality a city can be livable while not sustainable. As an example, a natural environment of a jungle is sustainable but it's not livable for human kind. Opposite situation is also possible, while a city may look and act like a livable environment for its dwellers it can leave much negative outputs for sustainability of the rest of the world. Newyork city can be explained here as an example of a livable environment with high avergae revenues per person while making people in other parts of the world poor as well as leaving lots of waste to be transferred to other parts of the world. Also considering the scale of a city, there are always agencies and lobbies that are actively manipulating the statistics regarding sustainability goals. A realistic instance of such cases can be seen in a case that reached media in 2019 in which unrecyclable waste plastic was produced by residents in Canada and was transferred to be buried in Malaysia. (Zhou, 2019) On the other hand the CO2 that is produced in developed countries such as United States, Canada, France or even in China have shown to be effective on increasing overall temperature, consequently creating unpredicted rains and floods and over-heat, but the effects firstly show in vulnerable parts of the world and later with a lower extent to the countries that produced those wastes. As an example, considering geographical conditions, Bangladesh is one of the most vulnerable countries regarding global warming, while

it is not among countries with high production of CO2s or plastic waste. Statistics related to CO2 emission is also a problematic data, since these data are not easy to recheck by individuals or private agencies while they have become highly important in political debates, governmental bodies and companies in national scale have shown to indicate false information about amount of CO2 emission. An example of such incident was the manipulations of results of real CO2 emission of cars produced by almost all European companies tested between 2009 and 2012. According to Ben Knight's study published in Deutsche Welle's website; "Carmakers are exploiting weak and outdated EU laws to claim misleading statistics about fuel efficiency, … real-world CO2 emissions are up to 40 percent higher than in the lab." This is very important because according to the same source, these data are accounted for 20 percent of total CO2 emissions; "traffic in Germany produced some 162 million tons of greenhouse gases in 2015, a figure that has actually risen by 10 million tons since 2009, and which accounts for 20 percent of Germany's total CO2 emissions." (Knight, 2016) It can be concluded that in reality people from other parts of the world (vulnerable geographical locations) may pay the price of global warming sooner than those who are making the trouble. This means a country or city might be marked livable by current definitions while it is not sustainable to be considered an actual contributor to global warming issue.

Livability and sustainability concepts are inseparably linked, "however, in practice; a sustainable city is not de-facto livable and a livable city is not de-facto sustainable" Leach (2016). She argues these two concepts can, and should, be inextricably entangled, incorporating social and environmental wellbeing within the context of low-carbon living environment and secure resources although excessive literature on these subject in different disciplines has made it open to wide range of interpretations.

Conteh & Oktay (2016, p.24) point out ambiguous definition of livability; “There, seems to be no agreement as to what liveability really means; it is a compendium of value statements about the needs, desires, and aspirations of people cutting across a vast area, be they social, political, or economic.” However, there seems to be some sort of agreement on emphasize of the social dimension in literature as an important aspect of livability. Jane Jacobs (1961) is a key figure on bringing up the social dimension as a feature of livable urban space, highlighting sidewalks and vibrancy of mixed retail and dense residential spaces. Wheeler (2001 [1998]:490), believes “there is widespread agreement on basic elements that make cities and towns livable—a healthy environment, decent housing, safe public places, uncongested roads, parks and recreational opportunities, vibrant social interaction” but he also tries to draw a blurry line between sustainability and livability; “there is a body of work on making cities sustainable but leaves out much discussion of the social dimension for ‘livable’ spaces.” Fischer (2000) is another key figure who focuses on communities on the Clinton–Gore Livability Initiative “Building Livable Communities for the 21st Century” which was launched in 1999 in an effort to strengthen the government’s role in building “livable communities”. She sees the livable community as a ground for social bounding of users and from her point of view “safe streets, good schools, and public and private space that help foster a spirit of community” provides the essential atmosphere for creation of a livable space. Livable spaces, then, should provide opportunities for urban dwellers to participate in community. While community itself is fraught with ambiguity (Staeheli 1997; Staeheli and Mitchell 2006).

Balsas (2004) defines a livable place as “safe, clean, beautiful, economically vital, affordable to a diverse population and efficiently administered with functional infrastructures, interesting cultural activities and institutions, ample parks, effective

public transportation and broad opportunities for employment. It also connotes a sense of community." (p.103) In order to be able to achieve a more reliable outcome, current section focuses on livability while issues related to effects of urban lighting on sustainability is also briefly described in sections 5 as a separate topic from livability.

3.3 Livable for Whom?

It seems the critical role of context has not been well-pursued in literature concerning livability. Shall we consider economic growth and absorption of foreign investments always helpful in any context? This might not always be accurate considering point of view of dwellers. As an instance in Famagusta city- North Cyprus, growth of economy and population might not consider quite welcome from point of view of traditional dwellers. While this issue may raise the livability index rank as measured in currently available methods, it has negative impacts on local's perception of safety and security. So the critical question of 'livable for who and where?' remains ambiguous.

Balsas (2004) points out different meaning livability may have to different people and the fact that it's a concept that people recognize easily but it's hard to define in a way everybody understands. Hankin and Powers (2009, P. 848) suggest that "there is a complicated social dimension to livable urban space, a social dimension that geographers need to problematize." They believe "If we examine city spaces that are lauded as highly livable, we can get a sense of who is able to live and how." Answering who are the users of spaces and what they do, plus what they do not do, are also mandatory in reading livability of an urban space.

Pacione (1990:1) emphasizes the role of context in addressing livability; "the precise meaningdepends on the place, time, and purpose of the assessment and on the value

system of the assessor." Hankin and Powers (2009) and Ley (1990) perceive livability as an essentially ideological mindset in which definition of it for poor and middle-class is quite different, also for those who live in the village compared to urban dwellers. Ley also points out the competition over defining livability which discloses the eager toward defining quality of life for specific (contrasting) benefits of determinants. So the question of evaluating livability according to which measures is a critical a discourse. Hankins & Powers, (2009) refer to a problematic moment in that competition,referring to the disappearance of the Atlantic Station neighborhood, a national dwelling project in Atlanta-United States, from livable urban spaces despite project's overall claiming to be a "livable" urban space as a result of narrowly defined public spaces and the disappearance of the collective public buildings/spaces.

In order to further clarify the issue, we need to consider each method's objectives regarding definition of livability which may fall in scenarios explained below. If we consider each of A,B and C a city, X and Y users and livability an objective, relation between them can be described in two main situations;

1- 'A' city is livable. (obtains high grade from specific indicators)

2- 'A' city is livable for X ('A' city obtains high grade considering X's needs)

In the second case we need to define one of the X or Y variables to be able to assess the other one's performance. So basically, the second case and sub-scenarios are directed toward a comparative study.

- 'A' (known city/community) is high likely livable for those who are coming from 'B' and 'C' cities or regions (variable).
- 'A', 'B' and 'C' cities are high likely livable for X (known person/community)

Some of X's needs are common for all human beings and can be measured independently like safety, income and physical health. Some are dependent on the context and personal experience of users like, feeling of safety, cultural adaption and psychological health which may make an environment livable for X group but non-livable for Y group. It's essential to consider there will be degrees of un-comfortability. Mostly highest degrees happen in extreme cases like displacement of war refugees or forced gentrifications from highly contrasting cultures which makes it hard for Y group to adapt and consequently keeps them under constant social and psychological pressure.

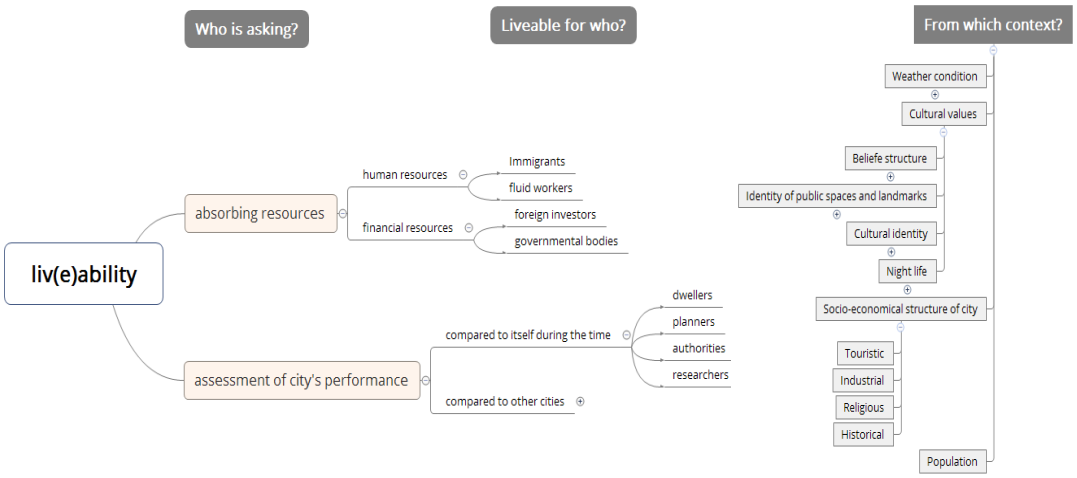


Figure 39: Livability within context, Source: author

Considering the dynamic nature of populations and people the fact that a supposedly negative trend in a specific context can reflect contrastingly positive issue in reality once more brings up the doubt of reliability of numeric analysis on livability discourse. "For instance, educational attainment levels may trend downward in a particular locality—not because students are failing to finish high school or attend college, but because they are leaving the neighborhood as they become more educated, leaving

older, less well-educated residents behind" National Research Council 2002). As result, indicators that are important in one place might be irrelevant in other contexts.

Another valuable discussion in the report provided by National Research Council (2002) called ‘Community and Quality of Life: Data needs for informed Decision Making’ is careful consideration of the scale in measuring livability:

> “Indicators of neighborhood livability, for example, cannot always be scaled up to a regional or state level, in the same way that large-scale indicators are not necessarily relevant at the community level. Even if scaling up or down is possible, it might not make sense from a policy perspective. For example, although health indicators such as infant mortality are meaningful at both local and global scales, many transportation or mobility indicators have little relevance at the global scale. A case in point is “walkability,” which can be measured only at a local scale and has relevance only up to a regional scale.” (National Research Council 2002)

3.4 Livability in urban centers, streetscapes and neighborhoods

Considering the scale of investigation, two streams can be identified in literature. First group’s approach is in the scale of a neighborhood or a district and mostly focused on societal dimensions and walkability. Second group’s focus is performances of cities with economic dimension as the main focus.

The first group has a more ideological approach, considering the subject as a framework applicable to any context to improve living experience indicators also referred to as ‘quality of life’. While indicators may vary, the core theory is looking at livability as a holistic concept which involves socio-cultural issues, morality and all levels (mostly upper levels) of human needs in Msolow’s hierarchical pyramid. (1981) This approach is fractal in nature as Nikos Salingaros (2003) suggests urban spaces should be, as the core concept targets living in a community at any scale, making it applicable to different scales such as a neighborhood, an urban district or the whole city. The main goal is to achieve livability applicable to both individuals and societies

as parcels that are making a city rather than looking at city from the bigger scale in a competition within a broader context. In this approach, the economy is equally important and other factors to bring safety, income, and health to some extent, but it is definitely not a key concept.

One of the key scholars in this group is Jane Jacob (1960) and her point of view on learning livability from socially sustainable everyday life of communities, neighborhoods and districts. Jacob's approach is an effort to extract frameworks and guidelines (sometimes by new moral, social and cultural norms or recognizing existing ignored norms) in organically formed multi-use districts recognized as vibrant and livable by the investigator. In other words, she broke the hierarchy of top-down analysis and brought up the necessity of taking a deeper look at places that happenings, gatherings and public lives are active and brought up the necessity to respect diversity and co-existence in urban planning. She was also a key figure on drawing attention of urban planners to the effect of natural surveillances on safety and perception of safety by introducing "Ballet of the Sidewalk" and "Eyes on the Street" concepts. Her cooperation with Oscar Newman (1966) is reflected on 'defensible space theory' which brings up the role of architecture and urban planning in social control, crime prevention, and public health.

Urban centers are important places in cities which have been focus of recent investigations in urban studies. They can be old historic districts or newer centralities, and they are characterized by a diversity of uses, such as retailing, housing, entertainment, and a mix of civic, administrative and professional services, among others. Very often, these centers experience boom and bust cycles, which negatively affect the livability of adjacent and older urban areas. These cycles are directly related

to the economy as well as to the region's social, cultural, historical and political trends. Some examples include the wave of peripheral shopping centers, added personal mobility, suburbanization, discount centers, malls, strip commercial areas, catalogue sales and online shopping. Balsas (2004, p.102) points out how "peripheral centers attract the most mobile and affluent customers, which leaves the old centers dependent on the local, poorer market" and would start a slow downward decline process. Local authorities have made efforts, especially in American cities where decentralization of urban centers has become a critical issue, to bring people back to urban centers in a recentralization process. In most cases main potential has been found to be reactivating evening and night-time economies (NTEs) which has also been the focus of authorities in UK cities. (See Chapter 2 for more information)

Balsas (2004) brings up the question; What makes a city center a livable place? His answer includes five dimensions of Kevin Lynch (1981, p.1) to the question; What makes a good city? Vitality, sense, fit, access and control plus Balsas' dimension: viability. In other words, he claims that "if a city center is a vital place, with sense of place and time, where the urban environment fits the human body and its activities as well, it is accessible and can be controlled but does not have the ability to attract continuing investment, it is not necessarily a livable place." From Balsas point of view retailing is a basic, integral component of urban life, perhaps the most critical one. "Without the economic relationship between customer (shopper, visitor, and employer) and supplier (shops, clubs, cafes and employers) the city center has only ceremonial and historic significance." (p.103) Although these statements are generally correct, there might be differences in different contexts regarding the priority of key factors. Further investigations in chapter five of current research points out the crucial pivot role of ideology in formation of city center in case of Mashhad city, where

retailing and other economical facilities act as secondary agents providing services for the main socio-cultural activities.

Zec, Erem & Colakoglu (2018, p.125) Defines quality of life as “people’s opportunity to access infrastructures communication and transportation modes, food, clean air, housing, networks of paths, open spaces, facilities, greenery and parks.” They refer to walkability as a principle that is getting more and more essential for a livable environment as “livable cities define an urban formation that inspires walkability by linking street patterns and facilities for living, working and recreation within an optimum closeness to encourage security, sustainability and pedestrian- friendly environment.” They have made a valuable research on walkability and come up with four networks to be provided to achieve a pedestrian friendly city; Networks of pedestrian paths, open spaces, facilities and greeneries.

Although these networks are essential to achieve a pedestrian friendly environment, it seems flexibility of urban spaces is not taken into consideration. A vehicle access can play the role of pedestrian path and urban open space by the help of network of night-time activities. In other words, safe and vibrant nightlife acts like a layer that is applied into existing infrastructures and increases livability factors by getting the most out of twenty four hours of day/night limit. Moreover, temporal dimension of night life allows it to transform and enhance spaces that are not considered as contributors to livability by their daytime characteristics, such as parking lots, vehicle paths and leftover spaces around urban structures into safe, walkable and economically active areas without expanding cities’ footprints. Hence focusing on increasing livability of existing structure of cities seems to be more logical and practical than considering a

frameworks and guidelines for new developments. Moreover, good examples of transformation of existing areas would also act as guideline for new developments.

The National Research Council (2002, P.24) defines livability as "the extent to which the attributes of a particular place can, as they interact with one another and with activities in other places, satisfy residents by meeting their economic, social, and cultural needs, promoting their health and well-being, and protecting natural resources and ecosystem functions." Also, this report considers an important role for livability regarding assessing "impacts of public and private actions and failures to act, and helps capture some of the externalities ignored or inaccurately valued by market mechanisms" such as "lending and investment policies, risk/reward assessments, and consumer, business, and government purchasing decisions."

Smith (1973, P.69) discusses dimensions of employment including "hours worked (full-time, part-time, etc.), wage rate, health insurance and retirement benefits, proximity to affordable transit and childcare options, and work safety provisions." Although mentioned items mostly fall under employment subject especially in united states, some of them like insurance can be provided in national level as social welfare services in other contexts. Also, proximity to affordable transit and childcare are two important items but not necessarily related to employment as they can be affected even more in eastern and middle-eastern countries by social and financial support of families.

In a recent research done by Norouzian-Maleki, Bell et al. (2015) a framework for assessment of neighborhood liveability is tested and developed. Data is collected by questionnaire and interviews following the Delphi method from 25-30 experts in the

field of housing, architecture and urban design from two 'contrasting' countries as defined by authors; Iran and Estonia. The result is 18 attributes in three categories ordered by their importance from the top to the bottom in table below.

Estonia	Iran
Built-form factors	
The proportion and scale of the spaces enclosed by buildings	An alternative appearance to the facades
An alternative appearance to the facades	The proportion and scale of the spaces enclosed by buildings
The provision of mixed-use buildings	The provision of mixed-use buildings
Contribution of buildings of different periods	Contribution of buildings of different periods
Spatial quality factors	
Quality of access to the residential public spaces	Amount of green space (Private and public green space)
Amount of green space (Private and public green space)	Presence of trees and natural elements
Presence of trees and natural elements	Quality of access to the residential public spaces
Management of the spaces	The sense of hierarchy between public and private spaces
Easy way-finding in the neighbourhood spaces	Visibility of public spaces
The sense of hierarchy between public and private spaces	Easy way-finding in the neighbourhood spaces
Visibility of public spaces	Management of the spaces
Presence of water features	Presence of water features
Social + community factors	
Volume and speed of vehicles	Lighting during the night-time
Joint activities opportunities	Presence of a variety of people in neighbourhood public spaces
Presence of a variety of people in neighbourhood public spaces	Volume and speed of vehicles
Quality of pavements and footpath surfaces	Joint activities opportunities
Usability of routes	Quality of pavements and footpath surfaces
Lighting during the night-time	Usability of routes

Figure 40: Indicators for assessing liveablity in neighborhood from point of view of experts ordered by their level of importance (Norouzian-Maleki, 2015)

An interesting case in this article is two radically different points of views regarding impact of lighting on livability. Among factors within social and community category, lighting has been perceived the most important factor by Iranian interviewees even before presence of people in public spaces, while Estonian interviewees ranked it the least important factor. This comparison again reminds the fact that livability is a relative concept that is highly dependent on the context. Also the fact that light has a special place in Persian culture, which is specifically in contrast with Edensor's (2013) point of view that lighting might have lost much of its potency to produce affective atmospheres and deliver aesthetically pleasing environments.

Harvey and Hall (2015) discuss the fact that livable streetscapes are essential element of livable communities, however it would be difficult to describe physical features of livable streetscape. "We might visualize livable streetscapes based on new urbanism,

smart growth, form-based code, or human-scale design that provide functional, comfortable, and beautiful user experiences. What building height, however, constitutes human scale? Theorists offer logical suggestions, such as a four-story limit for social interaction between street-level and upper stories, but these claims lack empirical validation. This might be due, in part, to the difficulty of collecting paired physical and experiential measurements at a scale and precision that is relevant to the spatial unit of individual streetscapes" (p. 149).

Another issue discussed by Harvey and Hall (2015) in their review of approaches regarding measuring livability, is the scale of measurements. While in the macro scale built-environment diversity and spatial connectivity in the context of urban form can be discussed, urban design narrows to a smaller scale and deals with public spaces, streets and individual buildings. Although it would be hard to measure livability indicators in the scale of urban design, it "should not be avoided by researchers because it is difficult to describe quantitatively. In many cases it might be necessary to use qualitative measures to capture its nuanced effects" (p. 150).

Walkability and accessibility are inseparable pillars of livability that relates with people from all ages in the scale of street and district. Walking provides social, environmental and economic benefits (Forsyth& Southworth 2008), because it is a green and simplest mode of transportation (Oktay , 2012) and it is healthy and enjoyable(Littman, 2011; Zec, Erem & Colakoglu, 2018). The subject of walkability is highly interlinked with safety, another pillar of livability mentioned by most researchers. While safety during the night is of great importance in current research and is more discussed in Section two, road safety and the opposing interest of vehicle derivers and pedestrians have always been investigated. Dumbaugh and Gattis (2005),

in their valuable research focusing on roadside safety, defining livability with references to walkability, scale, and safety of urban spaces that makes urban living an enjoyable experience. They investigates agents that results on reducing vehicle's speed and come up with results that "drivers use the total information provided by their environment not just posted speed limits." According to Dumbaugh "European designers view high-speed driving as incompatible with the safe operation of urban roadways. For all streets with any concentration of roadside development or anticipated pedestrian activity, design speeds are severely restricted, rarely exceeding 50km/h" (p. 294).

3.5 Livability in Global Context

The second group of studies mostly considered cities as products which are subject of branding and economic growth and absorb of resources (financial, social and cultural) from any context above city borders, in national scale or globally. Comparison is the key element in this group's studies which mostly involves with ranking of cities and a framework to evaluate and label cities as more or less livable by combination of indicators. Result of these comparisons mostly targets employers who need a basis to pay their globally mobile human resources (e.g. Mercer's ranking of livable cities) or authorities and governors who are involved with branding their cities in a larger context mostly for financial reasons.

The term 'quality of life' has also been used widely by politicians and economists to measure the livability of a given city or nation. Two widely known measures of comparative study of livability are the Economist Intelligence Unit's Where-to-be-born Index (2018) and Mercer's Quality of Living Reports. ("Quality of Living Data and Hardship Premiums for International Assignments", 2019). These two measures

calculate the livability of countries and cities around the world, respectively, through a combination of subjective life-satisfaction surveys and objective determinants of quality of life such as divorce rates, safety, and infrastructure. Not to be neglected that such measures relate to the population of a city, state, or country, not to the lower scales like districts or public spaces, and moreover, the fact that these measurements are done by private business in case of The Economist Intelligence Unit (EIU) and a consulting firm in case of Mercer. So, we expect them to be market oriented or focused on political and economic point of views financed by governmental bodies or similar authorities. Two more methods investigated in this study are City Analysis Methodology (CAM) which is more focused on city performance as a whole and the last case in this section is an example of academic research developed by by Zanella, Camanho & Dias. (2014) which is more in line with the scope of current research. Reason behind including this method is that it is not related to authorities or governmental bodies and livability indicators and weighting system are available and clearly explained.

3.5.1 Mercer's Quality of Living Reports

This method gathers data on quality of life based on ten categories and provides ranking for 498 cities worldwide. Main goal of this assessment is providing a system to calculate salaries based on hardship of living in cities for employees who are about to work abroad ("Quality of Living Data and Hardship Premiums for International Assignments", 2019).

The total index is based on the following categories:

- Consumer goods
- Economic environment
- Housing

- Medical and health considerations
- Natural environment
- Political and social environment
- Public services and transport
- Recreation
- Schools and education
- Socio-cultural environment

3.5.2 Global Liveable Cities Index

A thorough example in first group is done by Giap, Thye & Aw (2014), who have looked into subject of livability as a subject of competition between cities in absorption of "globally-mobile resources such as talents, high net worth individuals, investors, innovators, entrepreneurs, and capital that are recognized to make positive contributions to economic growth, economic resilience, global political influence, socio-cultural innovation, and international lifestyle impact." (pp. 177) This research framework was first introduced by Tan et al. (2012) and is the basis for the Economic Intelligence Unit (EUI) organization's evaluation of livability which provides a ranking system for 140 cities worldwide in five categories: stability, healthcare, culture and environment, education, and infrastructure. (Economist, 2019) This method is clearer than Mercer's method as indicators and weighting systems are available. However, some indicators seem to be highly dependent on user's own experiences. For instance, humidity and temperature rating which is the first indicator of culture and environment category is highly dependent on each person's living experiences as one who have always been in humid climate may find it hard to adapt with dry climate. Also, religious restriction mentioned in fourth indicator of same category is highly ideological and related to each person's background. While a religious city might be

perceived as an uncomfortable environment which has many restrictions, might be considered as an ideal environment for those involved and follow a religious lifestyle. Those indicators are not reflected directly in Table 7 which is accounted for conclusion of this chapter, instead more generalized items like diversity of choices which can be beneficial for all kind of users are being considered as an indicator.

Category 1: Stability (weight: 25% of total)

Indicator	Source
Prevalence of petty crime	EIU rating
Prevalence of violent crime	EIU rating
Threat of terror	EIU rating
Threat of military conflict	EIU rating
Threat of civil unrest/conflict	EIU rating

Category 2: Healthcare (weight: 20% of total)

Indicator	Source
Availability of private healthcare	EIU rating
Quality of private healthcare	EIU rating
Availability of public healthcare	EIU rating
Quality of public healthcare	EIU rating
Availability of over-the-counter drugs	EIU rating
General healthcare indicators	Adapted from World Bank

Category 3: Culture & Environment (weight: 25% of total)

Indicator	Source
Humidity/temperature rating	Adapted from average weather conditions
Discomfort of climate to travellers	EIU rating
Level of corruption	Adapted from Transparency International
Social or religious restrictions	EIU rating
Level of censorship	EIU rating
Sporting availability	EIU field rating of 3 sport indicators
Cultural availability	EIU field rating of 4 cultural indicators
Food & drink	EIU field rating of 4 cultural indicators
Consumer goods & services	EIU rating of product availability

Category 4: Education (weight: 10% of total)

Indicator	Source
Availability of private education	EIU rating
Quality of private education	EIU rating
Public education indicators	Adapted from World Bank

Category 5: Infrastructure (weight: 20% of total)

Indicator	Source
Quality of road network	EIU rating
Quality of public transport	EIU rating
Quality of international links	EIU rating
Availability of good quality housing	EIU rating
Quality of energy provision	EIU rating
Quality of water provision	EIU rating
Quality of telecommunications	EIU rating

Figure 41: Livability indicators in five categories provided by Economist Intelligence Unit (The EIU)- Source: Official website: https://www.eiu.com/n/postponed-the-2020-global-liveability-index/

According to Giap et al. (2014) livability measures are typically used as a tool to make comparisons between cities with various outcome scores receiving widespread media attention. While referring to Scott (1998) who brought up the competition between metropolitan regions, they discuss the fact that borders of countries have become less visible and competition between nations are transferred to competition between cities and easy flow of talent and wealth within a larger context, like European Union or North America for instance, can emphasize on the role of each individual city in absorbing these resources and those that lack required standards of competitiveness will shrink economically. In short, EIU's focus is providing information for large employers who deal with flow of employees in the context of economic growth, global marketplace and absorption of resources.

3.5.3 City Analysis Methodology (CAM) and UK City Life1

City Analysis Methodology (CAM) was the core element of the Livable Cities program which was done from 2012 to 2017 to identify and test fundamental interventions that will lead to sustainable and livable cities of the future. (Leach et al, 2016) The program was focused on UK cities with implications for cities worldwide and provides a tool called UK City Life1 which is consisted of four layers. First layer is Lenses (categories); society, environment, economy and finance, and governance

and policy. The second layer is called Goals, which defines general desired outcomes for each category, followed by the third layer: Actions needed to achieve goals and, finally, measurable indicators. In total 347 indicators are defined in this program to evaluate the city's performances. Below is an example of how indicators reflect information within each lens. (Additional information available online: http://www.liveablecities.org.uk).

Lens: society

Goal: enhance community and individual wellbeing

Action: promote healthy living and healthy long lives. Sample indicators:

Number of publicly accessible sports halls,

Number of transportation fatalities (fatal road casualties),

Number of publicly accessible grass pitches,….

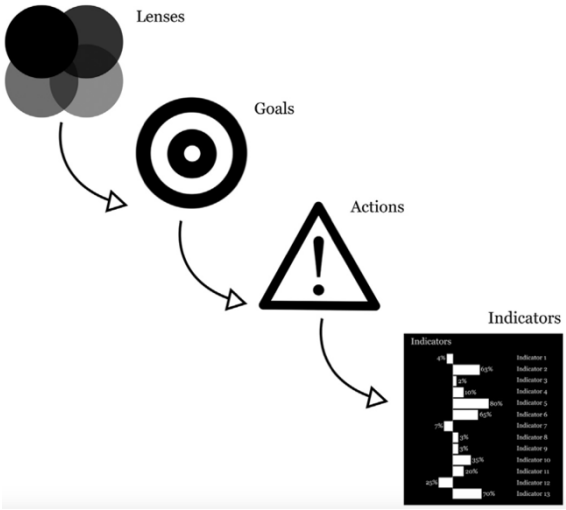


Figure 42: Lens framework for measuring livability, first defined as UK City LIFE1 framework by Leach et al., (2016)

The convincing point about this method is the high number of indicators and clarity of goals, which makes it ideal for evaluating cities' performances in general and

comparing it in the future for further evaluation. However, the final outcome is more of a dataset of measurable indicators bounded together in categories but not melted to provide an overall grade for cities' performances. In other words, creating a big dataset of indicators related to livability is indeed a valuable ground for further investigations of cities involved in data collection process, while "societal wellbeing in a low-carbon and resource-secure cities" as proposed as a prioritized focus is not fully met. Holistically measuring the performance of a city has pushed the project through quantitative measurable aspects of livability leaving questions related to users and contexts un-answered. Outcomes of this method once more remind us the necessity of narrowly focused researches, as well as general ones, to penetrate to deep social-cultural layers of cities and find different yet similar customs that might be ignored by standardization process of a general research.

3.5.4 Livability Indicators and Weightings by Zanella, Camanho & Dias.

Zanella, Camanho & Dias. (2014) identified twenty four indicators for the assessment of livability in European cities, as shown in Table 3, extracted from database of over 300 indicators provided by the Urban Audit project. Further details about the Urban Audit indicators, including a compilation of definitions and measurement procedures, can be found in Urban Audit (2010) and Artemis Information Management (2012).

Livability components	Dimensions	Indicators
Human wellbeing	Housing quality	Average living area per person (m^2)
		Proportion of households living in owned dwellings in cities
	Accessibility and Transportation	Multimodal accessibility (EU27 = 100)
		Share of journeys to work not done by car
		Length of public transport network per inhabitant
	Human health	Life expectance
		Infant Survival rate (per 1,000 live births)
		Available hospital beds in cities (per 1,000 inhabitants)
	Economic and Social development	Employment per 100 of residents aged 15–64
		GDP per head
		Median disposable annual household income
		% of the households receiving more than half of the national average household income
		Population per recorded crime
	Education	Proportion of students completing their compulsory education
		Students in upper and further education per 1,000 resident pop.
	Culture and Leisure	Annual cinema attendance per resident
		Annual visitors to museums per resident
		Number of libraries per 1,000 residents
		Green space to which the public has access, per capita
Environmental impact	Solid waste	Collected solid waste—tonnes per inhabitant and year
		Proportion of solid processed by landfill
	Air pollutants	Accumulated ozone concentration exceeding 70 microgram/m^3
		Annual average concentration of NO_2
		Annual average concentration of PM10

Figure 43: Selected indicators to asses cities' livability by Zanella, Camanho & Dias. (2014)

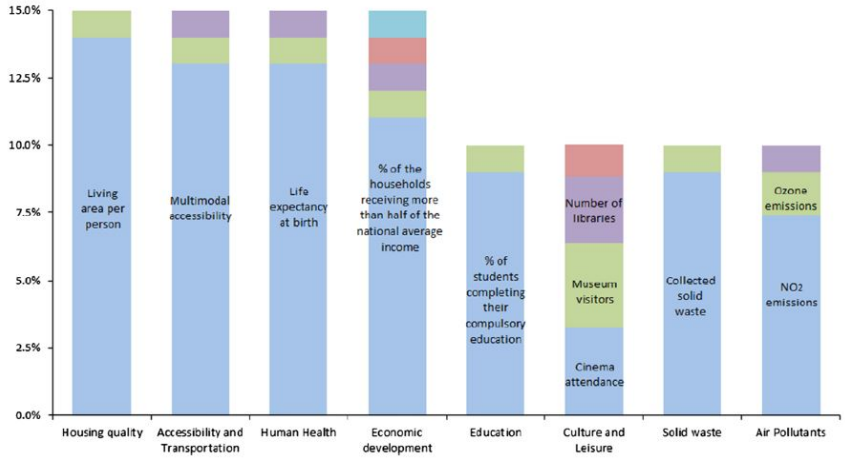


Figure 44: Weight selection for each dimension for Berlin by Zanella, Camanho & Dias. (2014)

The terms health and wellbeing have been interchangeably used in literature. In order to be able to establish a common framework for further investigations, definition by World Health Organization (WHO, 1948) which includes physical, mental and social well-being, has been considered as the basis of investigation. However, since there are concepts that can also be seen through other aspects of livability, like cultural identity, social and mental well-being are categorized under a bigger umbrella of socio-cultural aspects.

As discussed in the beginning of this chapter, there are quite number of definitions on the subject of livability in literature and each study takes its own interpretation based on its goals and objectives, however, there seems to be common items outlined in most definitions. Moreover, a trend can be traced in literature toward considering social issues as an undeniable pillar of livability. Table below (Table 4) is collection of definitions and key factors that are found to be sharing more or less common aspects.

Table 4: Definitions and key factors of livability throughout the time

Scholars	Definitions of livability	Key factors
Leach et al. (2016)	"Because of extensive writings and reflections on sustainability and livability, their meanings remain nebulous and open to a myriad of interpretations." …. livability and sustainability can, and should, be inextricably entangled, incorporating social and environmental wellbeing within the context of low-carbon living environment and secure resources.	Social and environmental wellbeing
A. Zanella · A. S. Camanho · T. G. Dias (2014)	In this context, the purpose of this paper is to develop a methodology for conducting a fair and data-driven assessment of cities' livability taking into account several dimensions, in order to deliver viable guidelines for improvement. This was achieved by the development of a composite indicator that, besides of providing an overall measure of performance for each city, enables benchmarking in such away that it becomes possible to identify the strengths and weaknesses of each city, as well as the peers with similar features to the cities with worse performance.	Housing quality, Accessibility and Transportation, Human health, Economic and Social development, Education, Culture and Leisure, Solid waste, Air pollutants
Giap, Thye & Aw (2014)	Livability has become key characteristic of cities that enable them to attract globally-mobile resources (such as talents, high net worth individuals, investors, innovators, entrepreneurs, and capital) that are recognized to make positive contributions to economic growth, economic resilience, global political influence, world agenda-setting power, socio-cultural innovation, and international lifestyle impact.	eEonomic growth, economic resilience, global political influence, world agenda-setting power, socio-cultural innovation, international lifestyle impact
National Research Council. (2002)	Livability refers to the attributes of a particular place which can, as they interact with one another and with activities in other places, satisfy residents by meeting their economic, social, and cultural needs, promoting their health and well-being, and protecting natural resources and ecosystem functions….. .. helps capture some of the externalities ignored or inaccurately valued by market mechanisms. … wage rate, health insurance and retirement benefits, proximity to affordable transit and child care options, and work safety provisions	Economic, Social, Cultural needs - Health and Well-being – Protection of natural resources and ecosystem functions.
Economist Journal (2011)		Job opportunity, cost of living, public transport and roads, safety and security, culture and nightlife
Wheeler (2001 [1998]	"There is widespread agreement on basic elements that make cities and towns livable—a healthy environment, decent housing, safe public places, uncongested roads, parks and recreational opportunities, vibrant social interaction, and so on"	healthy environment, decent housing, safe public places, uncongested roads, parks and recreational opportunities, vibrant social interaction
Hankin and Powers (2009)	"There is a complicated social dimension to livable urban space, a social dimension that geographers need to problematize." They believe "If we examine city spaces that are lauded as highly livable, we can get a sense of who is able to live and how."	Social dimensions, Users Context
Dumbaugh (2005)	Livability refers to a normative vision of the walkability, scale, and safety of urban spaces that go into "making urban living enjoyable"	Walkability, Scale, Safety
Fischer (2000)	Livable spaces should have safe streets, good schools, and public and private space that help foster a spirit of community and should provide opportunities for urban dwellers to participate in community. She emphasizes the government's role in building "livable communities".	Safe streets, good schools, and public and private space that help foster a spirit of community
Newman, P. G. (1999)	Livability is the positive outcome of all resource inputs in a city. Alongside there is a negative outcome which is waste.	Health, employment, income, education, housing, leisure activites, accessibility, urban design quality and community
Pacione (1990:1)	Livability is complex and inherently relative: "The precise meaning [of urban livability] depends on the place, time, and purpose of the assessment and on the value system of the assessor"	Context dependent assessment, Relative in nature, Different behavioral factors, Purpose of the assessment
Ley (1990)	livability is a polyvocal discourse. Livability requirements for middle class urban dwellers may be quite different from the requirements of the inner city poor. "the contest over [the meaning of livability] reveals much about the various publics who have competed for the power to define the quality of urban life"	Context and user dependent
Jane Jacobs (1961)	Articulated features of livable urban space, highlighting sidewalks and active retail spaces mixed with dense residential spaces.	Diversity of functions; Sidewalks and active retail spaces mixed with dense residential spaces

3.6 Summary of Chapter

Literature review confirms extensive study on sustainability and livability. Since the livability concept is highly dependent to its context, any study related to measuring the livability ends up with an almost new proposed method. Livability of urban spaces, therefore, only can be seen in a specific context. However, in the scale of cities, livability can be compared utilizing specific indicators.

How can we get closer to the "ideal relationship between the urban environment and the social life it sustains" (Hankin and Powers, 2009). Instead of an ideal relationship which might bring up the different definitions of ideal in different context, this research focuses on a 'better relationship' than whatever current condition in the given context is. Newman's (1999) definition which gives a comprehensive yet straightforward insight into the subject has been considered as basis of further analysis. In this context we consider improving living environment by reducing resource inputs. Among resource inputs defined by Newman food and water inputs are excluded as they do not have strong relation with subject of this research.

- 'Land' is interpreted as footprint of cities on natural environment which would include better use of existing lands within city borders to fulfill social and economical needs of users including residents and visitors.
- 'Energy' would include reducing usage of all kinds of energy including efforts that have been made up to the time of research (manpower, decisions and analysis) by people and authorities as well as its traditional meaning such as electricity, or materials used in public spaces.

- ‘Harmful building material’- Considering the term ‘building material’ used by Newman may lead to reduction in diversity, details and ornaments by miss-interpretation of the concept and turn urban environments into a monotonous man-made landscape. Instead, we would rather consider reducing non-recyclable and toxic materials as building materials themselves are not necessarily against the livability concept.

It is fundamental that decision-making processes concerning city-center development respect subjective sensorial diversities alongside any technological or design-led interventions if the ultimate goal is livable 24-hour cities (Adams et al. ,2007). It is essential to recall, that current patterns of urban life and consumption habits are not healthy nor sustainable over the longer term and the truth that force of capitalism and massive advertisements on dissemination of consumption culture is so strong that continuous education of generations might become effective to set back consumption goals and bring up sustainability goals as a more important priority.

Urban regions are often hotspots for water, air, and soil pollution resulting from their long histories of unregulated heavy industrialization and reliance on the automobile (NRC, 1988). Moreover, most larger cities of developed countries consume a disproportionate share of ecosystem resources and leave a huge amount of waste, affecting vulnerable countries and cities elsewhere.

In sum, livability is complex multifaceted concept. It is also a highly relative term as what would be considered a livable community in one part of the world might be deemed highly unsatisfactory in another. This might be due to cultural differences or to different standards of living that alter expectations for urban design, transportation,

other infrastructure, and service provision. Nevertheless, the idea of livability remains a powerful one. In fact, the very generality of the term allows diverse groups of stakeholders to come together and make livability a public policy goal.

The table below (Table 5) identifies indicators as defined by prominent scholars (referenced by numbers) on the subject of livability. These indicators are categorized and grouped into four main dimensions; Health, Socio-culture, Economy and Infrastructure.

Table 5: Livability indicators categorized in four dimensions, source: author

Livability dimensions , sub-dimensions and indicators in literature		
Livability Dimensions	**Sub-dimension**	**Indicators**
Health 1,2,5,8,9, 10, 13	Physiological wellbeing 13,	Life expectancy *1,2,3,4,10 - Infant survival rate *4,5,6 – Hospital beds per person 1,2,10 - Low carbon living environment 2,10, 12 - Availability and quality of of private healthcare 9 – Availability and quality of public healthcare 9 Sport facilities, 9,10 Time/week for sleep 10, Obesity rate 10 – Air and water quality 10, 12 Food availability 10 – Health insurance 14 – Clean environment 15
	Safety 6, 11, 15	Safe public spaces 5, 6, 11 - Crime rate 9, 10 - Car accidents - Military conflict 9, - Terror 9, - Transportation fatalities 10, Number of police officers 10 – Number of firefighters 10, Response time for emergency calls 10 Work safety 14
Socio-cultural 3,4, 5, 6, 7, 8, 10, 11,13,	Recreational and attention restorative opportunities 1	Parks and natural environments 8, 10 - Recreational opportunities 5, 8 - Cultural activities (including festivals and holidays) 15 - Time/week for leisure 10, Beautiful places 15 Scales fitting human body 15
	Social and mental wellbeing 2, 13	Education 1, 6, 8,9, 10 – Sense of Community 1,5, 6,11, 15 - Perception of safety (person, neighborhood) 10, 11 – Sense of belonging 10,11 – Sense of place and time 15 -– Social vibrancy (+vitality)10, 11, 15 - Having social support members (relatives,friends) 10 – regularity of face to face conversation 10 – Child care services 10,14 - Elderly services 10 - Suicide rate 10
	Diversity 11	Activities 4,11, - Ethnographic (Age, gender) 10- Multi-cultural environment 4, 9,11 - Food and drinks 9, 12 - Consumer goods and services 8,9 ,10 -
	Political environment 8, 10,	Passport power, Political parties
Economical 8, 10, 13, 15	Income 10, 14	Income over expenses rate (affordability)1,10,14, 15 - Employment rate 1, 10 , 14 – Diverse employment opportunities 15 - Grow of number of businesses 10, 15 - Income of households, 10 - Availability of online work/ work from home 10 - Retirement benefits 14 - Ability to absorb investment 15
	Housing 1,5, 8,10, 12	Living area per person 1,2,3,10 - Housing quality 9,10 - Housing affordability 10
	Council or authorities spending 10	Spendings on services sector, cultural facilities, planning services, education services, highway and public transport services, social care services, 10
Infrastructure 4, 10, 11, 12	Infrastructures 9,10, 12, 15	Walkability 1, 5, 10, 11, 12, 15 - Accessibility to public or affordable transport 1, 5, 10, 12, 14, 15 - Accessibility to green and blue spaces 10 ,12, 15 Open spaces 12 - Time spent on commuting 10 - Road quality and network 1, 5, 8, 9, 10, 12 - Availability of resources and quality of energy, electricity and water 9, 10 - Traffic
	IT and telecommunication provision 9, 10	Mobile access 10 - Internet Access 10 - Public/Social Media Censorship

Numbered references	1.Newman, 2.Leach, 3. Oktay 4. Jane Jacobs, 5. Wheeler, 6. Fischer, 7. Hankin & Powers 8. Mercer 9. Economist Intelligence Unit, 10. Leach (CAM method) 11.Jane Jacob – 12. Zec, Erem & Colakoglu – 13.National Research Council – 14.Smith 15. Balsas

Chapter 4

ANALYSIS AND DOCUMENTATION METHOD

Efforts have been made in previous chapters to extend our vision on two fundamental concepts. It was pointed out that the effects of light in utilization of urban spaces and the formation of a relatively new urban experience are powerful. However, there seems to be no framework to act as a common ground for further analysis of light in urban spaces. Hence, this chapter is dedicated to creating a practical model as a foundation stone for further investigation of night and light in urban studies.

The meethod proposed is derived from the findings of the literature review and case study analysis. As result there are two available starting points for further analysis of other cities. The start point (A) in figure 45, is for cases that have the potential to extend theories related to urban night including cities known as city of lights and 24/7 cities. The second start point (B) can be used to evaluate and document current nightlife of any city without focusing on extension of literature.

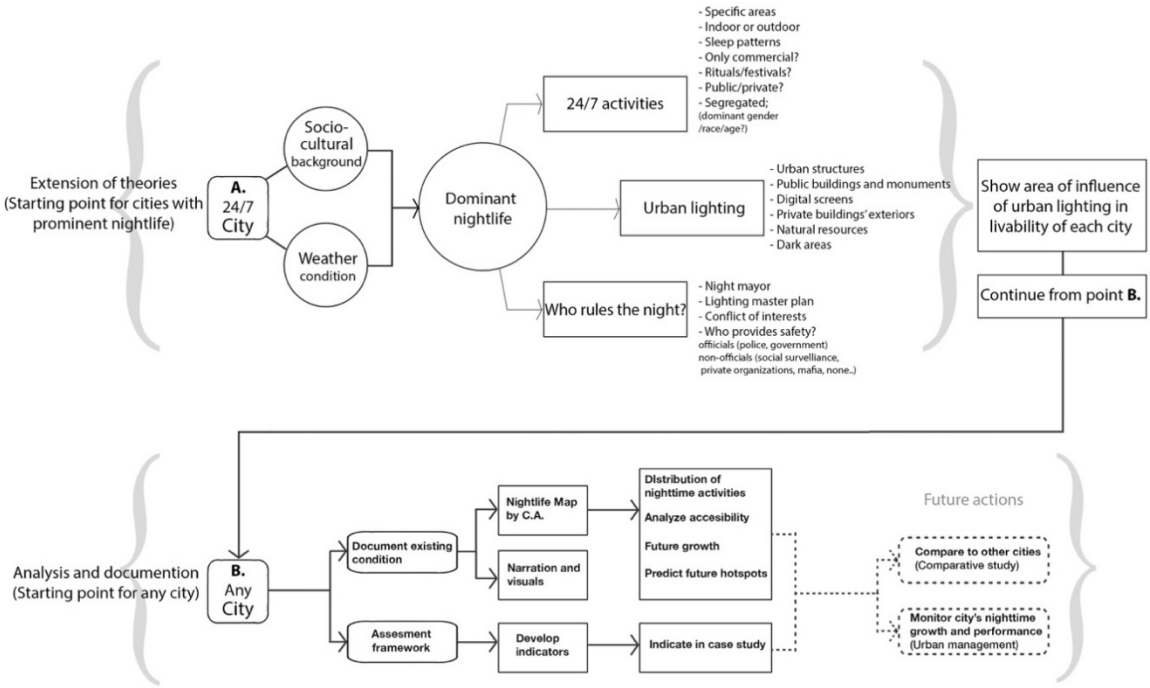


Figure 45: Proposed method's diagram- Source: Author

Reason behind considering the case as the starting point of the model is that it has been concluded that every city has its own culture which affects anticipation and perception of dwellers from many aspects including lighting. Based on literature investigation, theories related to urban lighting are investigated in chapters two and three, and possible effects on livability are identified. Afterward, theories related to urban night are extended based on Mashhad case. Investigation of the case starts with taking into consideration affecting agents of local culture (Persian and Islamic culture) and weather condition (cold and dry climate) and continues by observation and documentation of dwellers behavior in nightlife hotspots.

The analysis follows four main parts;

1. Descriptive text which covers cultural values, traditions, customs and dominant aspects of city's culture

2. Descriptive evaluation of nightlife indicators through the lens of livability (4.1.)
3. Evaluation of city's urban night with available data using 'urban lighting indicators' (4.2.)
4. Mapping of nightlife and evaluation of accessibility via cellular automata technic

4.1 Contribution of Nightlife to Livability

The fact that urban lighting affects livability of man-made environment is not a new topic. It can easily be imagined that without streetlights, the essential spirit of city would be turned back to the spirit of villages at night. However, the current role of urban lighting is way more than illuminating streets, and the night phase has shown to be more than a complementary part of day activities of cities. While nightlife may exist at some levels at all kinds of cities, looking into the subject from the point of view of cities that are highly active at night, we had found out that those who have lived in such conditions consider nightlife and night activities as an essential component of their routine life. They depend and rely on night-time activities.

Taking into consideration the fact that the livability concept partially depends on users' backgrounds and living experiences, together with reviewing actual instances of utilization of urban spaces at night in case study, brought up the necessity of clarifying the impact of urban lighting or the broader concept; nightlife, on livability of cities. These two concepts, livability, and nightlife, have been investigated in chapter 2 and 3.

Following the process of defining livability in Table 5, in Table 6 indicators that can show effects of urban lighting on livability dimensions and subdimensions are identified. While some of the indicators can be shown by quantitative measurements, the majority of indicators are qualitative instances that need to be discussed by text and visual presentations. Table 6 can be considered as a checklist of the items that can be enhanced by urban lighting and contribute to livability of cities. Achieving all items mentioned in the table can be considered as a high grade from known potentials of urban lighting. However, since converting qualitative investigations into numerical data would not reflect the whole atmosphere, the descriptive text in the table is an important part of the research's result.

Table 6: Area of influence of urban lighting on livability

Area of influence of urban lighting on livability			
Livability dimension	**Sub-dimension**	**Description**	**Indicators / Instances**
Health	Physiological wellbeing	Availability of medical facilities at night	24/7 hospital/health services
		Availability of sport facilities at night	Basic outdoor gym facilities in public spaces
			Illuminated and functional jugging and bicycle paths
			24-hour indoor sport facilities such as gyms, swimming pools, sport salons
		Loss of darkness (sensorial) Excessive light intake surpasses melatonin production in brain, weakening body's immunity system Darkness limits vision and provokes other senses, excessive illumination without preserving urban dark, semi-dark areas surpass other senses rather than vision	Dark and semi-dark areas in urban nightscape
			Light trespass trough residential windows caused by streetlights and façade lightings
	Safety	Illuminated streets and public spaces reduces crime rate by decreasing hiding spots for offenders while increases possibility of facial recognition	Lowered crime rate at night
			Perception of safety by dwellers/users
Socio-cultural	Recreational and attention restorative opportunities	Being in close proximity to natural environment Possibility of outdoor activity in less polluted air condition Leisure activities	Illumination of urban greeneries
			Changing the focus of light to greeneries instead of hard surfaces wherever applicable (Parking lots)
			Alternative use of existing urban spaces as leisure activities, night markets or other functions at night

		Restorative environment and recreational activities; possibility of distancing person's attention from daily routines (being away) or get their effortless attention (fascination), and supports people's intended activities (compatibility) Changing the focus of light to greeneries instead of hard surfaces wherever applicable (Parking lots)	Illumination of publicly available natural resources such as seas, lakes, gardens, and/or adjacent public areas
			Illuminated restorative natural and built environment
			Lighting on public/private landmarks, artworks or urban structures
		Psychological relief of pressures Reduction in fear, stress and sadness	Illumination of public landmarks instead of private buildings
			Lit streets and pedestrian accesses
			Surfing the city at night as a leisure activity
			Having a place to go at night
	Social and mental wellbeing	Safety, Security, Fear of crime Number of crimes and incidents at night fall during festivals and public events Sense of place is increased by festivals and urban celebrations Incrementing safety of public spaces by increase in number of natural collective surveillances/observers. Illuminated pathways increases perception of safety. Visibility of paths and accesses reduces stress.	Perception of safety increases in illuminated urban spaces Increased number of users reduces fear of crime due to natural surveillances/observers
			Number of public festivals/events and active nights per year
			Availability of educational opportunities
			Vibrant social interaction at night and being in a crowd of people (group ecstasy effect)
			Visibility of paths and accesses reduces stress

		Cultural identity and sense of belonging Urban lighting creates a strong city image Sense of belonging to a larger group Public and private space that help foster a spirit of community	Vibrant nightlife can boost cultural identity Common public experience that forms a sense of belonging to a group and/or boosts cultural identity through collective (or cumulative) public events such as concerts, festivals, religious events/rituals Visual or cognitive channels such as national/religious landmarks
	Diversity	Multi-cultural environment Ethnographic diversity (Age, gender, culture) Diversity of activities and functions	Diversity of Illuminated landmarks to relate to various backgrounds (educational, national, historical, financial, cultural, religious and monumental landmarks)
			Possibility of being in contact with people from different age, gender and cultural background
			Possibility of attending or having the option to choose between variety of activities
Econimcal	Income	Direct investment from other cities/countries in forms of buying lands, starting businesses and any other clues that reveals investments have been made by non-locals especially in 24hour economies Since tourists are free of working hour routines, any form of 24/7 active areas are popular touristic attractions Illumination of landmarks boosts positive city image and absorption of tourists and foreign investments	Absorbing tourists and foreign investments Income opportunities
			Any form of 24/7 active areas including; - Historic sites - Religious buildings/semi-open spaces - Redlight or similar districts - Functional sea side activities - Early morning restaurants - Casinos, clubs and nightclubs
	Employment	Providing job opportunities for mid and low-income group	Authorities' approach toward vendors and night markets (Relaxation of regulation regarding use of public spaces for vendors and night markets)

		Flexible working hours	Extended open hours regulations
			Availability of night-markets
Infrastructure and legibility	Accessibility Legibility, Protection of natural resource	Accessibility of 24/7 activities Night-map: Diverse and unique lighting on building or urban structure helps orientation and recognition by differentiating districts (specific color, visually unique approach toward buildings, specific lighting fixtures)	Availability and accessibility of active nodes at night by foot and vehicle
			Visually rich cityscape as a potential for cruising the night with vehicles as a recreational activity
			Illuminated landmarks makes the city more readable
			Cityscape as a sight worthy of respect, even admiration
		Reduction in transportation/commuting by accessibility of facilities within walkable distances Flexible use of empty lands and parking lots without extending urban footprint by providing light in potential lots and urban public spaces. This approach probably also boosts land value.	Active nodes at night in the scale of districts increases accessibility by walk and reduces in-city travels
			Instances of night markets, food streets or temporary cultural events
	Light pollution and energy consumption	Lowering consumption of energy Sky glow and disruption of circadian cycle	Use of LEDs for street-lightings which holds majority of electricity consumption of city at night
			Downward cutoff streetlights Effective regulations on façade and urban structure lightings (downward illumination sources, controlled or no upward lights)
			Light trespass on residential windows

4.2 Urban Lighting Indicator

After defining the area of influence of urban lighting on livability in the previous section, the gap of considering aspects of nightlife in livability subject is more apparent. Summarizing the effects of urban lighting on livability led us to define Urban Lighting Indicator, which should be considered as an aspect of livability. This indicator sheds light on which activities occur and how urban lighting affects the use of urban spaces at the dark phase of cities. The indicator reflects five aspects: Accessibility, Economy, Activity, Visuality and Perception of night.

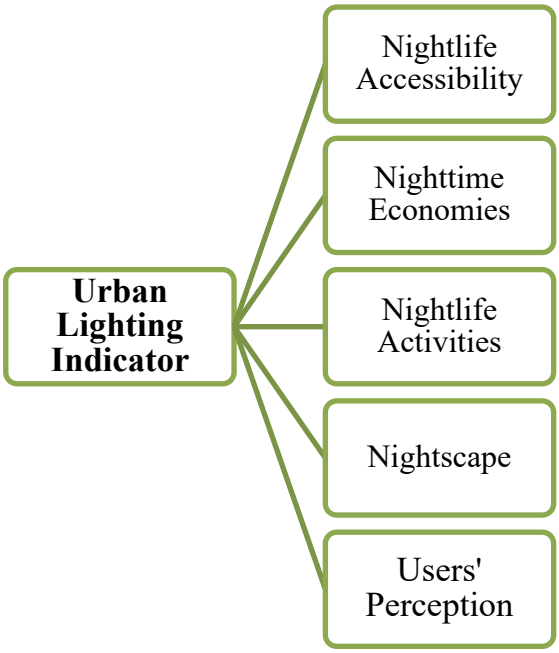


Figure 46: Five aspects of Urban Lighting Indicator

As mentioned before, all components that affect the presence of light in urban spaces such as the illumination of shops, streetlights, façade lightings and urban structure lightings have been taken into consideration not only those that are specifically recognized and done as urban lighting projects. Efforts have been made to provide a measurement method for those aspects that can be reflected by numbers or ratios to

provide a platform for further investigation of cities' performances or for further comparative studies.

Table 7: Urban Lighting Indicators Measurements

Nightlife Accessibility	**Pedestrian accessibility** (P.A.)	$\frac{Total\ area\ connected\ to\ a\ node\ within\ 500m\ (m2)}{Total\ area\ of\ investigation}$
	Vehicle accessibility (V.A.)	$\frac{Total\ number\ of\ active\ nodes}{Population}$
Nightlife Activities	**Family time, light sports:** Jugging, riding bicycle, skateboarding, badminton, outdoor gym facilities	$\frac{Total\ area\ of 24/7\ parks(m2)}{Population}$
	24/7 or late-night indoor sport facilities: gyms, swimming pools, sport salons	$Number\ of\ 24/7\ indoor\ sport\ facilities \times nights\ open\ per\ year$
	Leisure 24/7 or late-night collective events: outdoor or indoor concerts, events, rituals	$Number\ of\ events\ per\ year$
	Diversity of activities	$Number\ of\ available\ functions$
	Vibrancy	$\frac{Number\ of\ users\ at\ night}{Number\ of\ users\ at\ day}$
	Crime rate	$\frac{Number\ of\ crimes\ in\ urban\ spaces\ at\ night}{Number\ of\ total\ crimes}$
Night-time Economies (NTEs)	**Night-time economies' revenues**	$\frac{NTEs\ total\ revenue}{Total\ revenue\ of\ city}$
	Absorb of foreign investments on late-night industries; Bars, restaurants, cafes hotels, sports, events	$\frac{Inward\ investment\ GPD\ on\ 24/7\ or\ late\ night\ industry}{Total\ foreign\ investments}$

	and concerts or any similar investments that relate to night activities depending on the city	
	Regulations	$\frac{Number\ of\ active\ nodes\ at\ night}{Population}$
	Flexible use of empty lands	$\frac{Instances\ of\ flexibile\ use\ of\ empty\ lots\ at\ night}{Population}$
Nightscape	**Dark and semi-dark areas in urban nightscape**	$\frac{Total\ dark\ area\ (m2)}{Total\ area\ of\ investigation}$
	Nightscape as a refuge	$\frac{Number\ of\ illuminated\ public\ buildings}{Number\ of\ private\ buildings}$
	Light pollution: upward lightings, cut-off streetlighting	$\frac{Downward\ LED\ streetlights}{\{street\ lenghts\ (m) or\ district\ area(m2)}$ $Total\ streetlights$
Perception of users *Can be evaluated by interviews/questionnaires	**Rich and diverse nightscape**; Cityscape as a sight worthy of respect, even admiration	$\frac{Number\ of\ users\ consider\ nightscape\ as\ sight\ worthy\ of\ respect, admiration}{Total\ number\ of\ interviewees}$
	Feeling safe; going out by foot or by vehicle at night	$\frac{Number\ of\ users\ consider\ going\ out\ at\ night\ safe}{Total\ number\ of\ interviewees}$
	Surfing the city at night as a leisure activity	$\frac{Number\ of\ users\ mentioning\ night\ surfing\ as\ leisure\ habit}{Total\ number\ of\ interviewees}$
	Cultural identity and sense of belonging	$\frac{Number\ of\ users\ consider\ illuminated\ landmarks\ and\ urban\ lighting\ as\ an\ identity\ index}{Total\ number\ of\ interviewees}$
	Legibility	$\frac{Number\ of\ users\ consider\ urban\ lighting\ have\ increased\ legibility}{Total\ number\ of\ interviewees}$

4.3 Mapping urban night

The night-time network of cities has never been seen as in important issue in history to be documented or analyzed. However, nowadays, the level of activities and the number of active nodes at night have increased enormously due to progress in lighting technologies. As a result, the night network of big cities is more extensive than many small and mid-size cities. Therefore, documenting and visualizing these networks paves the way for better understanding of night phase of cities.

The city is evaluated in two scales; In the scale of a district, in most cases there are already divisions made by municipalities within the scale of city called districts or similar that can be the starting point of investigation. Each district/zone can be experienced by a long walk by a user or a researcher, and its formal characteristics such as urban tissue and solid void relations can be checked by free google map application and by this method we look at active nodes from the same point of view of users which enables us to get into topics that can't be discussed from upper scales such as urban design quality.

The second scale is the whole city in which the network of night-time activities and its growth is the subject of an investigation which would be more useful in management and planning scale.

Each cell in this method can hold a particular state or function that is primarily subjective to change according to conditions of neighboring cells. In this study, efforts have been made to adapt fuzzy cellular automata to include level of illumination of each cell which can be achieved by measures taken by luxmeter.

Documenting urban lighting network by fuzzy method provides the ability to calculate more complex combinations of on/off and range of illuminations in prediction or other functions applicable to cells and nodes. It also provides the possibility to apply customized rules to each node (lamp post) or area (cells) and observes reaction of network based on established rules. For instance, we can forecast future growth of night time economies networks based on our prediction of growth of one cell. Also we can identify the most efficient solution to reach illumination to a specific spot (crime hotspot or a critical traffic spot) in the map, or, approximate number of lamp posts needed to light up any urban space. This method can be used to map urban spaces with high rates of crimes at night and measure level of light in the crime hotspots and adjacent areas/pathways, however, the primary utilization of night-time map of cities remains to be as a basis for urban lighting and urban planning and design projects by visualizing nightscape visual axis and network of activities. Data eventually would be visualized as a light-dark pattern to be used as a basis for further planning issues. Also it can be a basis for qualitative analysis of area supported by observations and/or interviews with residents, users and police department officials. Visibility and accessibility of scape routs would be initial analysis regarding safety which can be followed by identifying of glare effect and temporary blindness spots based on actual levels of light reflected on triangular network. More complicated set of rules can be achieved by combination of simple rules considering analysis principles at the time of investigation.

4.3.1 Scale

While scale of investigation might be clear from the title and previous sections, defining the applicable scale is an important issue for further use of this method and for further analysis and developments. Adams et al (2007) identifies first scale of

night-time activities as mini-markets or pubs on the ground floor of a building followed by a combination of pubs and retails outlets as second scale and geographical area as the third scale. Above mentioned categories are considered as basis in this research and is expanded as shown in table below. The current method inquires information from three first rows starting from the smallest components, nodes, while providing results in the scale of the last two rows. In the current study, results are considering the entire city, but the method is applicable in the scale of districts as well.

Table 8: Definition of scales used in this study to reflect size and nature of nighttime activities.

Scale	Instances			
Nodes Single active spots	mini-markets/ pubs at ground level	Single kiosks/ fast foods on streets/boulevards	24/7 drugstores	
Lines Linear expansion of activities	Few adjacent markets and pubs/cafes	Linear illuminated passages; parks/riversides	Informal vendors/night markets around an active node	Single nodes along highways/boulevards that are considered close for vehicle users
Area Combination of nodes and lines creating a cohesive network	Wide pedestrian areas	Combination of active streets reachable by walk	Stablished night markets	Local parks
Districts Big areas recognized in the scale of city by all residents/tourists	Touristic areas such as red-light districts /cultural 24/7 landmarks (Redlight district- Amsterdam, Masjid-ol-haram- Mecca, Samen district-	Seasonal festival areas	CBDs, city centers/ dowtowns/ Ethnic towns (chinese)..	Big parks (National) and highly active natural resources such as beaches/mountain parks (Bondi beach- Sydney- Mellat and

	Mashhad, Istiklal street-Istanbul)			Koohsangi park- Mashhad)
24/7 cities Recognized beyond borders of city in national/international level	24/7 cities/ Cities of lights LasVegas, Paris, Cairo, NewYork, Mashhad, Tokyo, Istanbul,…			

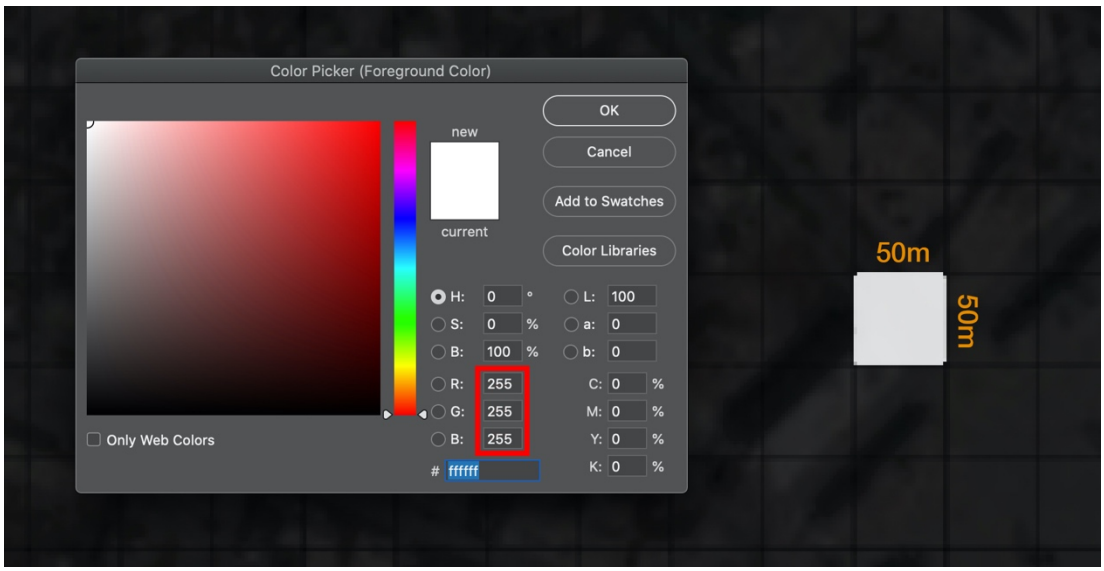
First documenting active spots by recording level of illumination, taking a picture and indicating the location by a 50*50 m square (called node afterward) on an inverted map of city. Level of brightness of these nodes on the dark map of city reflects illumination recorded at the place. Final result of this stage shows geographies of urban nightlife of city. We call it 'Nightlife Map'. Proposed map can be used as a basis for further analysis related to night studies. An example for calculating accessibility of nightlife in a case is provided in current study, explained in details in section 5.4. Provided map together with pictures taken and narration of customs and rituals related to night are considered as documentation of urban night and can be applied to other cities.

4.3.2 Application of Cellular Automata

Each active node in this method have been considered a 50*50 meters cell. By calling it active we confirm there was an open shop, a gathering or a functional urban space where people were actually using it at night. In other words, below map reflects those parts of city which can act as a destination at night, as small as a kiosk or as big as a multi-function complex. The size of activity can be recognized by number of on cells and the intensity of light can be recognized by level of illumination. So street lightings and other lights that are considered as minimum standards and doesn't reflect existence of people is not reflected in this map.

Level of light on each node has been measured by luxmeter. Maximum level of light documented around eye level was 1900 luxes, being that said, maximum possible level of light on eye level is considered as 2550 luxes which is reflected on digital format by dividing by 10. So 2550 lux in reality is reflected as R=255, G=255, B=255 on digital format which literally means pure white. Decreasing these numbers all together with the same ratio would give us darker cells toward pure black which is R=0, G=0, B=0.

Each active node (cell) considered in this research affects (by affecting neighbour cells) maximum length of 700 meters (bubbles) which can be reached within fifteen minutes of walk. A gridal network is applied to the city, each cell that contains at least one fully active node or combination of activities that are open at least until 2 am or open from 4 am is considered as an active cell.



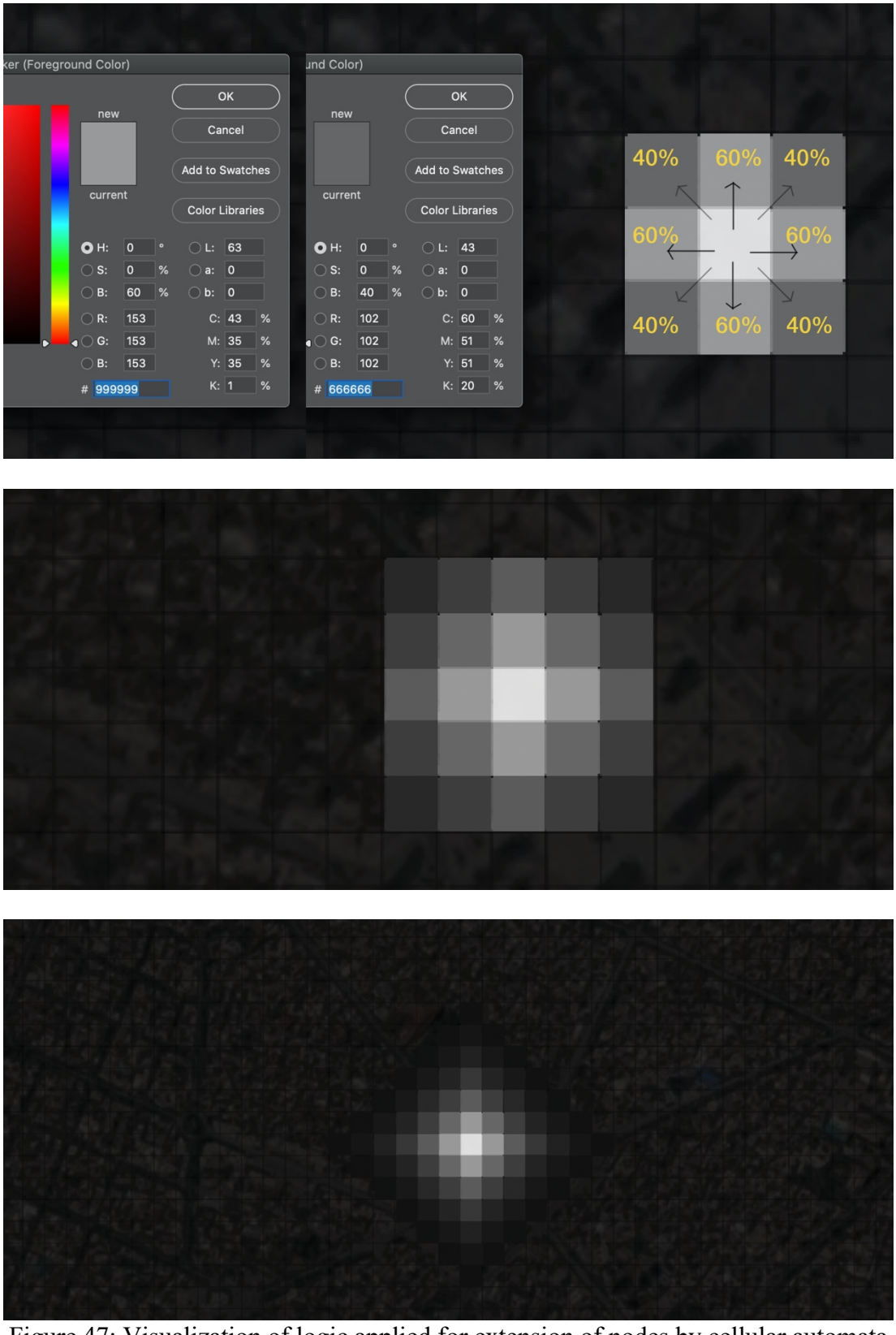


Figure 47: Visualization of logic applied for extension of nodes by cellular automata

Final result by this method is the Night-time Activities Map which can be used to;

- Reflects actual network of activities at night and respective levels of illuminations
- Calculate accessibility by foot (A.F.) to night-time destinations by a short walk by considering the ratio of active cells to whole cells (total area). We have not considered the nature of activity and potential users at this stage, for anlysis at the scale of district gender and age range can be taken into account by a percentage on illumination of cells)
- Calculate accessibility by vehicle (A.V.) by dividing the sum of active areas (bubbles) by the whole population
- Providing visual axes at night for further investigation of nightscapes in urban planning and design projects
- Predict future development of night-time activities

4.3.2.1 Application of Triangular Network in the Scale of Neighborhood

There are various initial configurations that lead to periodic or growing or moving patterns, etc. Triangular Grid, which is also called an isometric grid, is a grid generated by tiling the plane regularly with equilateral triangles. (Saadat, 2016) In order to create a flexible and adjustable to method that would be useful in variety of scales, fractal approach has been taken into consideration. This can be achieved considering the nature of triangular cellular automata network. The first module of this network is the minimum of three nodes that would cover a surface. (Figure 48) This module can be seen in urban lighting of streets which are very primary module of urban space. Although streets can also be lit by set of linear nodes, having combination of three nodes is the minimum for covering a surface or connecting to another string and create a network. Similarly, in cases where the width of streets exceeds certain size (12-15

meters), the street needs to be treated as a surface to provide illumination in both sides because traditional lamp posts could illuminate a certain range of areas. Once more, a triangular network becomes inevitable to cover the area in the most efficient pattern. So basically and logically, the pattern of a triangular network can be considered the primary module of urban lighting in public spaces.

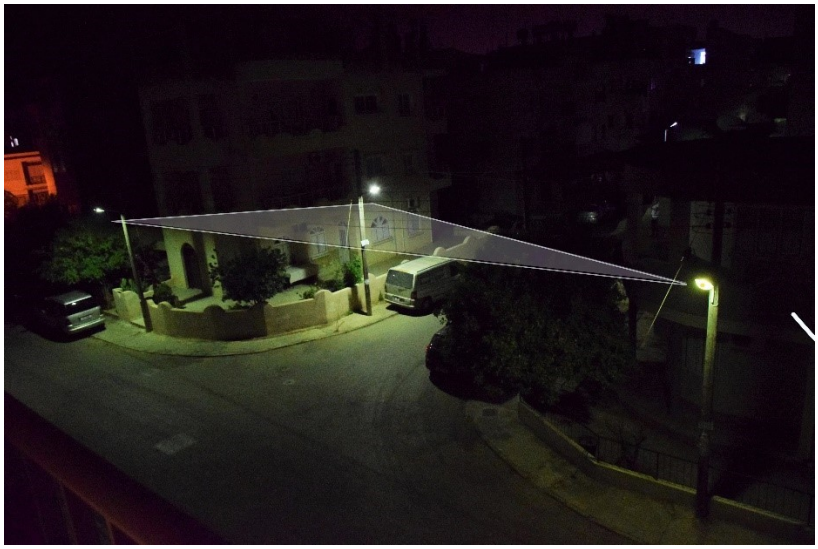


Figure 48: Formation of primary module of triangular network in a junction in a neighborhood

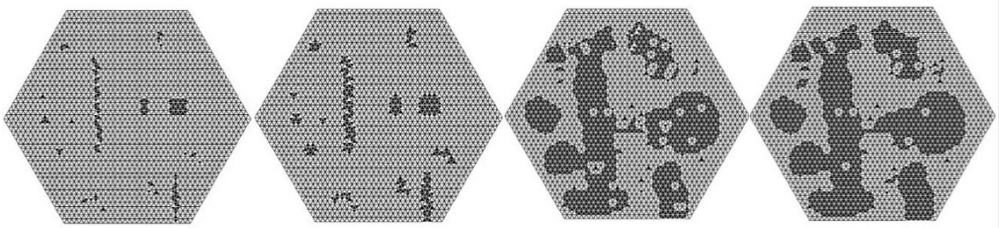


Figure 49: Four steps of growth of an imaginary combination of nodes in triangular cellular automata network by author - Software developed by M. Saadat (2016)

The example below is a primary analysis of a boulevard and a junction with high traffic. Illumination is measured by luxmeter and reflected by a triangular network. Investigating the light/dark pattern in detail demonstrates non-homogenous

distribution of light in the middle of the junction mainly caused by urban digital screens.

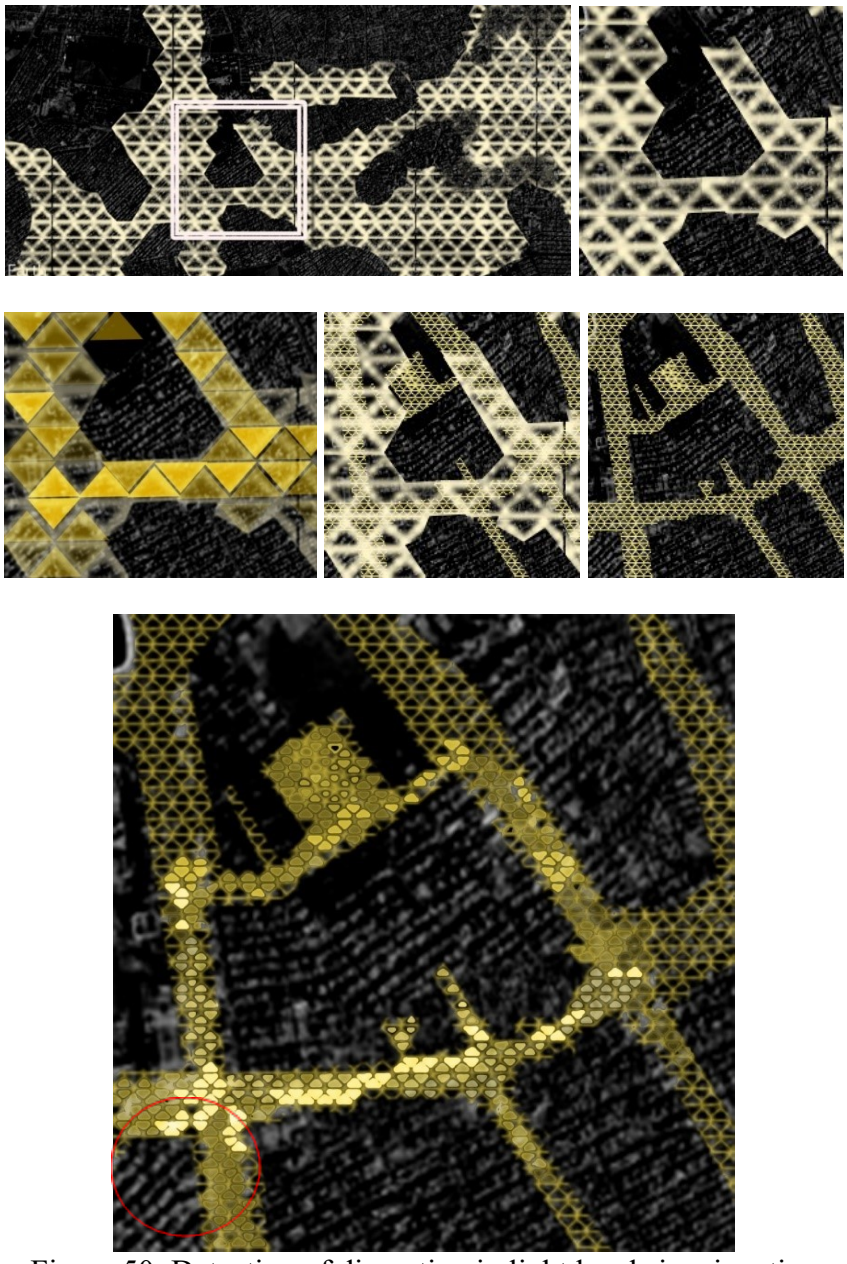


Figure 50: Detection of disruption in light levels in a junction

Although a triangular network seemed to be highly potential, applying it in larger scale, especially on bitmap images that are based on square pixels is hard to achieve at the moment. On the other hand, literature and softwares in the field of computer science are highly focused on applying cellular automata on square based networks.

Moreover, considering the fact that network cells in the subject of urban lighting should reflect different levels of light, the software should be able to read the map and apply cellular automata with fuzzy logic instead of just on/off logic. As summary, it was concluded that further development of software for the triangular network would be time consuming, unnecessary and out of the scope of current research. Therefore, using available square-based software that accepts bitmap images and extending it to compile with fuzzy logic would provide the intended results.

4.3.3 Accessibility of Night-time Activities

Accessibility is one of the aspects that is not much discussed in the context of urban night studies. Considering the hypothesis of this research that urban lighting affects cities' livability, a method to measure and document the accessibility to active spots at night is developed. Starting from a neighborhood by accessibility to a 24/7 supermarket or a bakery by foot, or accessibility of districts by vehicle in the city scale, the method adapts with different scales. Together with the physical distance between 24/7 nodes or zones, an urban ‘nightlife network’ of cities has been created.

In this study, walkable distance (10-15 minutes) was the basis of mapping urban night, which considered each cell covering an area of an approximately half square kilometer. For investigation in bigger scales, for instance monitoring growth of nightlife network, a combination of nine cells can be considered as a representative of an active node or an active zone in bigger scales.

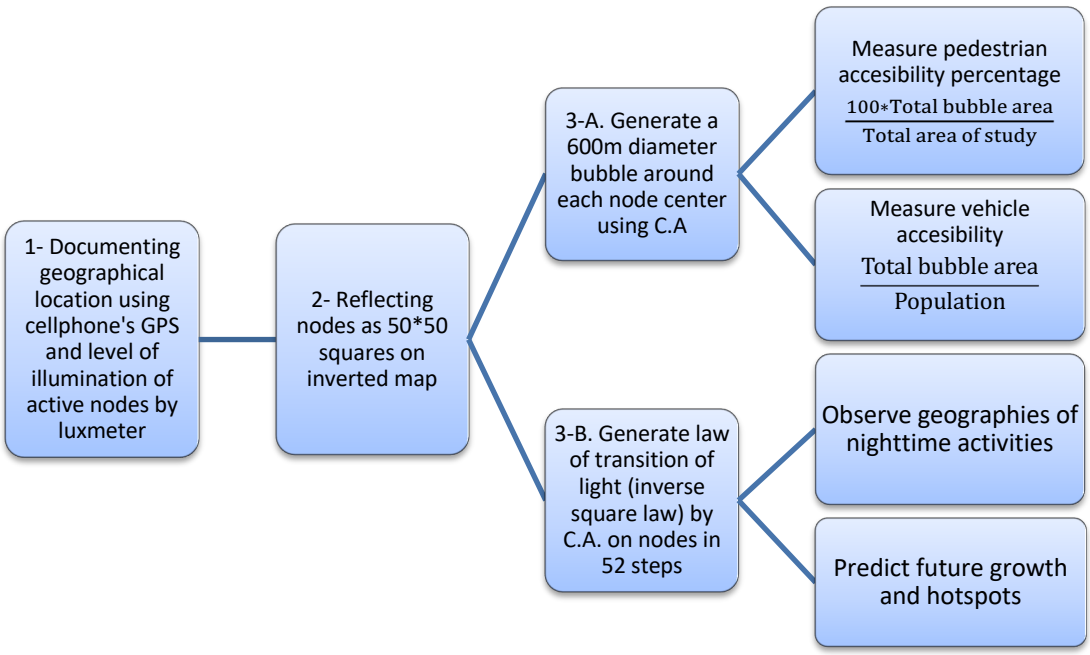


Figure 51: Diagram of application of cellular automata

Chapter 5

MASHHAD, CITY OF LIGHT

5.1 Introduction

Use of urban open spaces during the night is evolving and the functions hosted in such spaces are changing too. From the nocturnal protests of the 'Yellow Vests' movement in France ("Yellow is the Night", 2019) to 'night surfing' in Sydney's Bondi Beach ("Neon Night Surfing at Sydney's Bondi Beach", 2011), there have been huge shifts in the diurnal utilization of urban spaces. While "night is a natural phenomenon, night spaces are not. They are socially mediated. They do not exist prior to, or apart from, human practices." (Williams, 2008, p:514) The recent activities in France and Sydney are not the only examples of such happenings; various festivals, sports, religious practices, and gatherings have gained the option to occur after the sun sets partially because of great improvements in outdoor lighting.

However, night lighting of urban open spaces is not considered a new phenomenon in all cultures and all places. For example, active nightlife in urban open spaces in Middle Eastern countries has always been a part of local cultures (Amid, 2013). Tracing existing night-time uses and examining potential night-time uses of urban open spaces is becoming an essential aspect of city planning and urban design. Observing, analyzing, and documenting existing variations in these uses of urban open spaces may pave the way for a better understanding of the *night phase* of cities. This phase is getting bigger in number of activities and people engaged; therefore, it needs an

organized and planned night-time strategy. This issue may be a point of interest for municipalities, ministries, policymakers, urban planners, urban designers, and advertising agencies. In some cities, a new position, manager of the night phase, has evolved. In the city of Amsterdam, *night mayor* is a non-governmental position. Mirik Milan, a former club promoter who was elected to this position, believes using the night has been delayed for a long time because it was seen as opposition to the daytime economy of a city. "When there is a problem at night, the first reaction of city officials is always to say, 'OK, we have to stop this now' — often killing an industry with it," he said. He continued, "I think it is culturally determined that the night ... has always been seen as something which is maybe bad or rowdy. But the night gave creativity to mankind." (Stott, 2017).

This research is an attempt to expand our vision toward urban night by looking at the subject through theoretical framework of Gallan and Gibson (2011) on diverse night-time experiences and uses of urban spaces at the local scale of a city, which is well known to have 24/7 life in the context of Islamic cities. This study might be considered to be among a third wave of investigation defined by Hadfield (2014) on subjects of urban night and Night Time Economies (NTEs) in international contexts following the first two waves which were heavily focused on the English and Australian experience. Moreover, efforts have been made to take into account non-economic and non-alcohol-based practices as well, to put a step toward Shaw's (2014) point of view of investigating night from the 'assemblage urbanism' point of view.

Atepheh Amid (2013) pointed out the incongruous gap in literature when it comes to research about 24-hour societies outside the borders of Western Europe, Australia, and the United States. In Iran, similar to other countries in the Middle East, distinctions

between day and night activities are less visible. “There are routine activities such as shopping, window shopping, dining out, holiday meetings and family visit that take place at late night… Performing these activities at night in Iran is as ordinary as it is extraordinary in some other parts of the world…The advantage of these activities is that any specific groups of society based on gender or age are not excluded from cities’ night-life and almost everybody can find something to enjoy in the city at night.” (Amid, 2013, pp. 148-149) As a result of improved perception of safety, more people join and make the night more active and safer. This paper investigates the Middle Eastern city of Mashhad, a 24-hour city in the northeastern part of Iran which is also called city of light, and explores the city’s interactions with light and informal uses of urban spaces during the night.The research begins by providing a holistic image of a city in the national and international context and continues by looking at the smallest scale module of the city: the interiors of private houses as the first scene of investigation. The observations and documentation continue with larger and larger modules of the urban realm until reaching the city borders. Dwellings contain untold stories of how light is perceived at the initial encounter between people and space; hence, the second layer addresses exterior lighting of apartments, as the most common form of habitation within the borders of Mashhad. Looking at primary residential units from the outside builds awareness of residents’ first expression toward the public realm. Also façade lighting of public and private buildings is investigated in this stage. At the third scale, the lighting associated with urban landmarks and infrastructure that engage the city as a whole is investigated. These elements include boulevards, bridges, junctions, monuments, and digital screens that can be seen from longer distances.

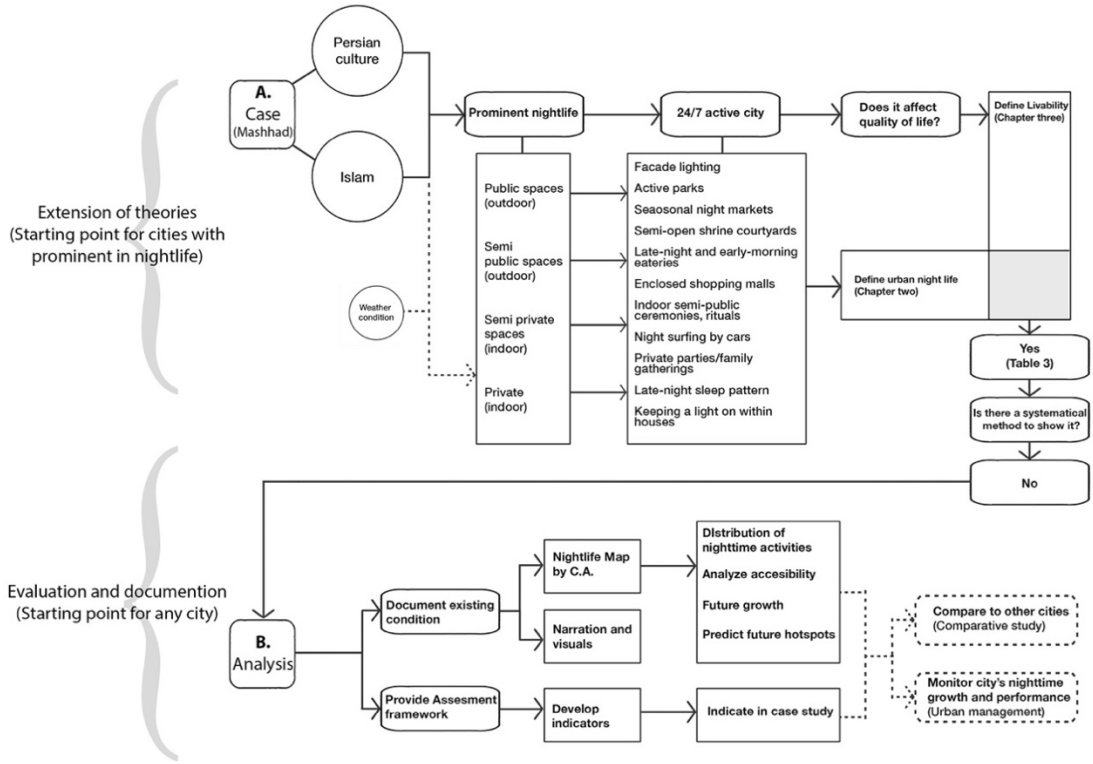


Figure 52: Application of method in case of Mashhad

5.2 Historical Development

Mashhad, with a population around 3.5 million, is the second largest city, located in North-East of Iran and annually hosts over 30 million visitors (Figure 53). The city, once located on the historical Silk Road, is characterized by its large number of visitors, a frequented shrine and 24-hour activities (Amid 2013). The size of the city's footprint tripled in the last decades of the 20th century. The expansion of the city was toward the west and northwest along an intercity road that connects Mashhad to Tehran. The city's growth in this direction may also be due to natural reserves of water sources and fruit gardens of the cities Torghabeh and Shandiz. Located to the west, these now act as service cities to the metropolis (Figures 55).

Figure 53: Location of Mashhad, Tehran and neighbor countries

Compared to some European cities, Mashhad has been relatively stable in recent centuries. The last time it experienced destructive war was between 1587 and 1598 when the Persians and Özbegs fought over ruling the region. Another serious destructive event was an earthquake in 1673 that demolished two-thirds of the city. (Gilliot, Avery, Hambly & Melville, 1994). Despite these events, altogether, the city has had a continuous physical life of 340 years and a cultural life of 420 years ("Imam Reza Holy Complex - UNESCO World Heritage Centre", 2017). Today, the city holds centuries of urban solutions and users' reactions to the changing conditions of urban living. . This is especially true for the Samen District, the historical core of the city.

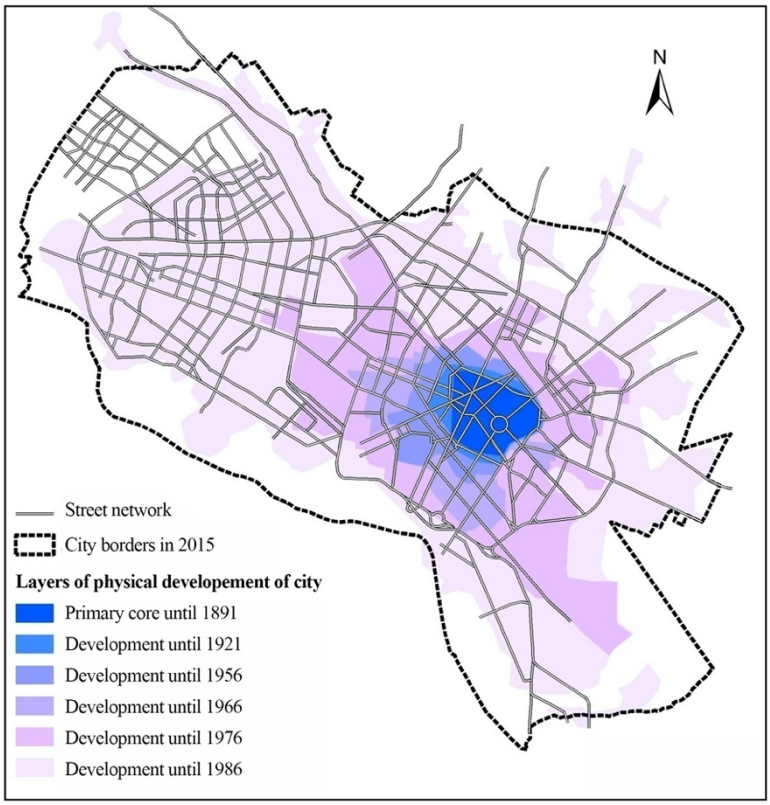


Figure 54: Hundred years of development of city, Source: Ministry of Roads and Urban Development, 2009

The heart of the Samen District is the tomb of the 8th Imam of Muslims: Imam Reza is a very important figure in the Shia branch of Islam. The majority of international visitors to Mashhad are from Iraq, Bahrain, Kuwait, Lebanon, Pakistan, Afghanistan, Azerbaijan, and Qatar. Imam Reza's tomb, within the Holy Shrine Complex, is the main reason for the formation of the whole city. The public mega-space of the shrine complex is a combination of centuries of development covering more than half million square meters (598,657 m^2) of open, semi-open, and enclosed public spaces, most of which have 24-hour accessibility ("The Glory of the Islamic World || Imam Reza (A.S.) Network", 2019). Besides the continuous presence of people throughout the day and night, the shrine complex and surrounding streets host active religious rituals and events throughout the year. Some of these events, such as Qadr Nights and Ashura Night, which is memorial of the martyrdom of the third Imam, specifically take place

at night, accompanied by public theater-like rituals. Within the borders of the shrine, commercial activity and sleeping are disallowed. Outside the complex, up to the scale of Samen District, shopping, dining, hospitality, and religious activities active 24 hours a day and have influenced newer developments throughout the city. Working hours in retail and service sections in the whole city typically extends until 10:00 pm while eateries and cafes are mostly open until 2:00 am. The city was announced in 2017 as the cultural capital of the Islamic world ("Capitals of Islamic Culture - Islamic Educational, Scientific and Cultural Organization – ISESCO –", 2017); however, unlike its competing predecessor, Mecca, it is freely visited by both Muslims and non-Muslims.

In order to be able to read the social and political geography of Iran, investigating Mashhad would pave the way toward understanding the belief structure of a majority of Iranians who have accepted the presence of Islam in political and social contexts of the country. The shrine complex and its administrative organization, Astan Quds Razavi is financially and socially supported by the people. Although the government seems to support the complex by eliminating its tax, in reality the opposite is true: the organization provides long-term loans to the official government of Iran ("Governments Owes More Than Three Thousand Billion Tomans to Astan Quds Razavi", 2017).

Figure 55: Aerial view of Mashhad and location of shrine complex in Samen District, Source: Google Earth, 2019

5.3 City of Light and Duality of Life

There is an abstract concept referring to cities which have light prominently symbolized in their culture. Paris, Eindhoven, Cairo, Bombay, and Las Vegas are some examples known as “City of Lights.” For Mashhad it is slightly different. The phrase is used in its singular form: “City of Light”, (Municipality of Mashhad, 2014). Mashhad is considered a city of light, and not a city of lights, because of its importance as a religious center in the Islamic world. Particularly, as a single light, it represents one of the five main tenets of Shia Islam: monotheism. As Mashhad was home to revered Imam Reza, the city’s slogan is also an allusion to God on Earth. After declaration of Shia Islam as the official religion of Iran in the Safavid Period, the city became the most sacred geographic location in Iran.

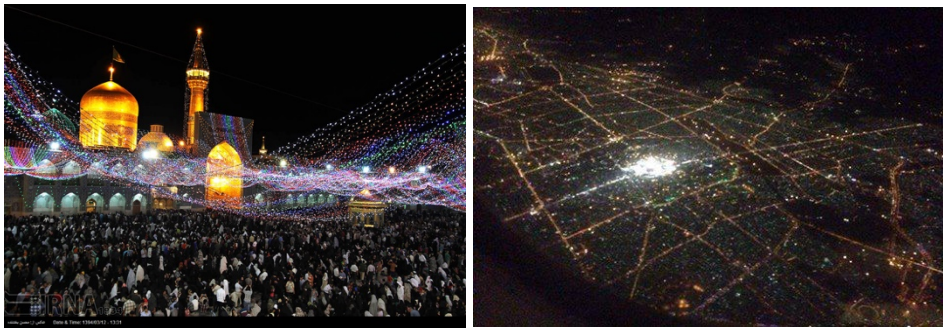


Figure 56: Left: Lighting in Mashhad's shrine complex during a special event (celebration of the birth of the 12th Imam at 1:30 AM on 2 June 2015) Source: Mohsen Bakhshandeh, 2016- Right: Aerial photo of Mashhad at night- The bright spot is the shrine complex, Source: Shobeir MohammadYari

Figure 57: Photos taken between 2-3 am-June 2010, shows night-time activities around shrine. Users include women, children and elders- Source: Atepheh Amid, 2013

Industrialization started in Iran around 1930 but it did not impact Mashhad's urban form until the 1960s and 1970s when a wave of population increases and further industrialization imposed the modern grid on the city's urban fabric. Modern cultural norms were also instilled even though they strongly contrasted with existing ideals that pivoted around the holy shrine. The pace of modernization was so fast in the Reza Shah period (1894–1921) that it provoked resistance from members of the public who were later labeled traditionalists. The traditionalists took power in 1978 and tried to set back modern-based ideologies in every aspect during a 5-year period called the *Cultural Revolution*. The reversal process started with reformations in education and later in fashion (e.g. imposition of the hijab), music, architecture, and many other

aspects. However, the wave of modernization and demand for housing and development overtook the traditionalists' efforts (Nabizadeh & Ulusu Uraz, 2017). The conflict between tradition and modernity is reflected as a duality in many aspects of Persian culture today, including politics, clothing, and social life. ("Society | The Duality of Life in Iran", 2019) Some scholars believe this dualism is a resurgent concept deeply rooted in Persian culture dating back to Zoroastrianism (1500-100 BCE) and Manichaeism (216-276 BCE) times (Gnoli, 1996) Regardless of the origins of the dualism, its presence can be felt in Iran's culture (Rigou, 2016), including in fashion (Gander, 2017), and it has become an ordinary aspect of political and social life in modern Iran (An, D'Silva, Williams & Lam, 2011) (McCann, 2014).

Today in Mashhad, the presence of both modernization and traditional development can be recognized in the urban fabric as well as in the interactions of the users with each other and with the city. Even in the night phase of the city, there is a strong contrast between the lifestyles and users of the historical core and those of the areas developed after modernism. For example, young vehicle users enjoy the freedom of getting around in the modern areas especially at night and can perceive the city as a whole because of their mobility. On the other hand, in the historical core, the atmosphere favors pedestrians and activities that are more related to religious values.

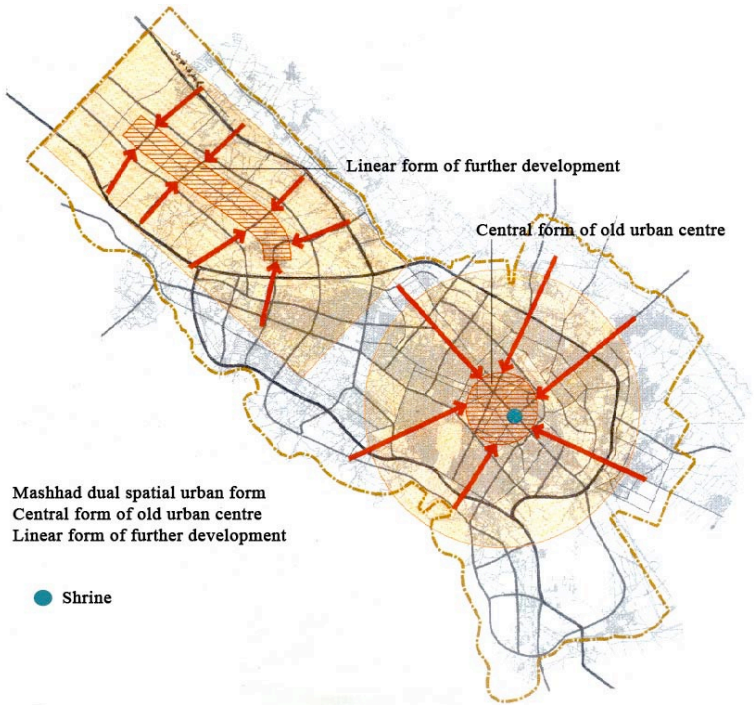


Figure 58: Duality in city's urban fabric. Source: Amid, 2013

All of these night-time users feel free to inhabit Mashhad's urban open spaces in their own ways. Some prefer experiencing the urban night from their cars. In modern areas, youth cruise the city streets for hours to get a chance to chat with occupants of the opposite sex in other cars; they exchange phone numbers and social media accounts. This has become a routine and the mobility of the activity reduces the chances of getting caught by so-called "social police" and parallel organizations that forbid activities like being with an unrelated person of the opposite gender, drinking alcohol, using drugs, having dogs, not wearing the hijab, and the like. As Williams (2008, p.515) points out, "The darkness of night facilitates opposition to policies or practices that seek to create a one-dimensional society." Riding around the city serves as an alternative to socializing in pedestrianized public spaces in and around the shrine complex which is constantly activated by people participating in religious tourism and traditional events. In the Samen District, the night-time character of urban space is very similar to its daytime character, covering 24-hour pilgrimage-related functions.

In contrast, users of urban spaces in newly developed areas shift from being out for functional reasons during the day to cruising the city for recreational purposes at night. Moreover, because the city has a cold and dry climate, the weather conditions do not favor outdoor activities during half of the year. At the same time, indoor public spaces are strictly under surveillance of Islamic rules by excluding any mixed-gender and alcohol- or music-related activity. Similar to the distinction in the urban fabric, there is social segregation that helps those users who enjoy religious rituals and activities feel free to spend their time in the 24-hour spaces of the shrine complex, while the others take refuge in private indoor spaces at night. The duality between these two distinct yet interlocked urban fabrics and their respective cultures can be observed in the forms of buildings, ornaments, clothing, and other visible details. The distinctions lie between the lives of tourists and locals, public and private, tradition and modernization, hijab-wearing and modern fashion, and the pedestrian and the car.

5.4 Scale 1:Keeping a Light On

There is a popular expression in Persian: چراغش روشن باشد. It means *keeping a light on*, and represents both the welcoming nightlight for visitors to a place and the desire for continuity of prosperity and life for a place and its inhabitants. It is used in reference to a house or a shop and can be traced back to a tradition in Mitraeism, one of the oldest known religions rooted in Persian culture. Four main components of creation – earth, water, wind, and sun – were represented by gods in Mitraeism. Mitra, the god of sun, was the prominent one and was worshipped as the source of light and life (Simon, 1991).

Later, Mitra was reflected in Zoroastrianism, the official religion of the Achaemenid and Sasanid Empires (550 B.C. to 650 A.D.). Zoroastrianism promoted worship of a

single god, and fire was sacred and highly respected as a reflection of God on Earth. High-ranking followers were appointed to keep fires burning in special fire temples formed as *chahartaghi*, meaning a place defined by four arcs. After the region was conquered by Muslims, the official religion switched to Islam and most of the chahartaghis were converted into mosques. There are versions of original fires still burning in Zoroastrian communities in Yazd, Iran, and in India, where some who resisted conversion to Islam in Iran migrated, taking their fire with them. There are different narratives about the continuity of the original fires. Since fire is perceived to represent God on Earth, some believe the fire never went out during the great exodus, while others refer to incidents throughout the history when the fires burnt out and were restarted. Regardless of strict continuity, the important issue is that the tradition of *keeping a light on* was preserved in Iran despite local conversion to Islam. It is still prevalent in modern Persian culture although it has been transformed many times during the process.

Figure 59: Niyasar Chahartaghi (Atashgah), Sasanid Period, Source:http://ammi.ir

In Islam, which has been highly influenced by previous religions, prophets and imams are considered the reflections of God on Earth, hence sources of light. Until the invention of electricity and the modernization of Iran, this custom of keeping a light

on, was done at night by keeping a candle on in individual (mostly traditional) houses. Nowadays, some modern houses still keep a lamp on during the night. Keeping the light on during the night is also traceable to special night-time events of the Persian calendar. The four most well-known celebrations related to the diurnal cycle are breifely reviewed,

- Shab-e Yalda (Yalda Night or Sheb-e Chelleh) is a celebration of light overcoming the darkness on the winter solstice which is the longest night of the year. Yalda night mainly occurs indoors; however, activities might be extended to outdoors. Friends and family gather together to eat, drink, and read poetry until morning when they can witness the day overtaking the night.
- Chahar-shanbe Souri (festive Wednesday), the the celebration of the night before the last Wednesday of the Persian year is residual of Zoroastrianism and it is commemorated by keeping a fire on during the night and jumping over it. (Kashef & Sirjani, 1990).

Figure 60: Jumping over fire on Chahar-shanbe Souri is reflection of a 2500 year old tradition of keeping a fire on during the night. source: https://www.hitehranhostel.com

- Ramazan, a month-long period when Muslims are recommended to fast during the day, is very active during the night when achievement in self-control is

celebrated until the sun rises. During Ramazan in Mashhad, indoor and outdoor leisure activities are shifted to night-time while daytime activities are culturally and officially curtailed from dawn to dusk. The 24-hour activity of Samen District is extended to other parts of the city in forms of night markets and food streets. Festive light strings above public spaces are also characteristics of Ramazan's nightlife. (Fig 65)

- Shabha-ye Qhadr (Qadr nights)[1], referring to revelation of the Quran, is also held during Ramazan. Staying up during these nights and reading the Quran is highly recommended by religious texts (Imtiyaz, 2009; Daneshgar & Saleh, 2016; Melton, 2011). In addition, many public gatherings happen in urban open and semi-open spaces which make the nightlife in public spaces more active and safer. In many cases in recent areas of development, urban public spaces are not well designed to accommodate such activities. Informal use of boulevard medians and pavements, blocking of vehicular access, and similar issues might be a new challenge for management of urban public space at night; however, since the Qadr ritual is deeply rooted in local culture, people have found a workaround by inducing flexible uses of urban infrastructure (Figure 61).

[1] Also known as Laylat al-Qadr and translated to English as the Night of Decree, Night of Power, Night of Value, or Night of Destiny.

Figure 61: Informal temporary use of urban open space in front of a mosque extendeds to sidewalks and boulevard medians during Qadr Nights, July 2019, 3:15 A.M. Source: Shobeir Mohammadyari, 2019

5.5 Scale 2: Facade Lighting

Mashhad was among the first cities in Iran to celebrate improvements in exterior lighting technologies, specifically LED-based equipment. In the beginning, shopping malls and banks started colorful façade lighting. Later, the exterior lighting trend could be seen on many public and private buildings with a variety of functions including residential. Façade lighting of four- and five-story apartments became a popular expression reflecting the owners' intention to show prosperity and market the building for higher prices. The private sector was highly motivated to experience and celebrate the use of cheap and easily accessible outdoor lighting fixtures. However, in the case of residential buildings, many owners turned off the lights after a while due to maintenance costs.

Figure 62: Exterior lighting of apartments in Mashhad. Source: author, 2017

In 2017, the municipality enacted an incentive for lighting building façades. The law offered a five percent discount for title deed expenses and taxes on new buildings. However, after the discount was granted, some building owners struggled with continuing the lighting. From informal interviews with responsible parties (mostly the residents who served in rotation as manager of 4- to 5-story apartment buildings), it seems that those who lived more than three years in apartments with exterior lighting gave negative feedback about electricity, repair, and replacement issues related to the façade lighting. In an informal interview with one of the residents he expressed his opinion on façade lighting:

> "It's been few months since we have turned them off… It's just a waste of money… We were all happy with the way it looked in the beginning; it was fancy and prestigious. But after a while, every week there was a new problem with either one of the projectors or their cables or the monthly charge of it… We'd keep them on if the municipality covers the maintenance!"

There is extensive competition among sectors that rely on direct investments of people, visualized in festive façade lightings. Banks, investment organizations, shopping centers and residential high-rise buildings that are selling their shares in the market have turned the night image of the city to a stage scene which is entertaining and confusing at the same time. Many of these buildings are either not open at night or not

open for public or even paid use. The lighting is meant to transmit the message of financial power of the organization behind it.

Figure 63: Although banks are closed at night, the prominence of competition between them is reflected in their façade lighting. Source: author, 2018

5.6 Scale 3: The Urban Experience

Effort has been were made to trace the unwritten rules and cultural expectations that have been applied to the lighting of Mashhad's nightscape. The digital information era, desire for instant gratification, global trends, aesthetic preferences, and the opportunity to maximize use through adaptable design are some of the influences that have guided the lighting of urban open spaces. Boredom with the urban landscape stems from lack of details and ornaments together with the digital era and the speed of access to new and different inputs. Because digital media users have adapted to having immediate exposure to a vast array of new information, ideas, and images, they seek

to have the same instant gratification from their urban environs. The contrast between sources of entertainment like television and the internet and the relatively static built landscape of cities results in the perception that the urban context is in a pause mode. Façade lighting systems that project changing scenes and arrangements of light counter boredom and fulfill the desire for instant gratification. Indoor experiences via digital media have boosted production of ornamentation and advertisements for the outdoor experience. Tracing back some customs related to use of light have shown the traditional role of light as an informative medium in this setting, however, the impact of global standardization and fast economic growth seem to have affected the presence of these traits. Instead new urban expressions and trends are emerging that are more chaotic and confusing than informative.

Christian Perreno (2017) brought up a valuable argument about different aspects of 'boredom' and how it may have affected our lifestyles. He argues that extensive use of social media is a response to 'Boredom in space' that is "part of the modern experience, emerged due to industrialization of labor grounded in regular working hours and patterns." "…people are moving between an interior personal (virtual) world space and the external public (physical) world space more fluidly than before." (pp. 99-109). There seems to be a direct relationship between boredom and the emergence and expansion of light into the urban nightscape. When the length of usage of urban spaces extends, a sense of boredom arises with architecture and recent urban developments, especially at night when fewer details can be perceived. Moreover, time spent in urban spaces is increasing due to population growth and car usage. As a result, together with low prices for electricity, different informative and decorative lights have emerged. Though caused by various agents, the lights can be identified clearly. The public and governmental bodies act together to provide ornaments of nightscape. This

observation can be crosschecked partially by the emergence of first static advertisements and later digital-screen adverts at junctions and along roadsides where people waiting in traffic experience boredom. At the Khayyam Junction in Mashhad, one of the most crowded vehicular nodes of the city, the traffic lights have the longest waiting times in the city (180-240 seconds at red lights) and shortest passing times (40 seconds on green lights). People spend three-quarters of their time waiting in and only one-quarter of their time passing through this junction. These times affect all types of users equally; it does not matter if they are pedestrians or vehicular users or which direction they are headed. Although the projection screens are clearly glaring in drivers' eyes, they have not been removed after 20 years because there are huge advertising profits behind them and people have become accustomed to, even entertained by, watching the content while waiting. The level of light produced by the screens fluctuates harshly depending on the content. For this study measurements recorded the level of light as 180 to 1100 lux in the middle of this junction compared to 25 to 50 lux in surroundings areas. When a traffic policeman was asked during his post in this junction if these screens could cause accidents, he replied, "Not at all, we don't hold such interpretations. These screens help with general illumination of the junction. Moreover, it is better to see something rather than nothing!"

Figure 64: Four consecutive sequences of the north side of Khayyam junction, Mashhad, Source: author, 2012

The pictures in Figure 64 show four consecutive sequences while waiting at the Khayyam junction. As can be seen in the fourth photo, the intensity of light reaching the eye from the digital screen is more than that of the truck's lights which is headed toward the camera. The screens clearly cause glare effects. Digital advertisement screens have become an effective tool in the formation of the nightscape. Apparently, extensive use of them has made them appear as a common pattern in Mashhad's nightscape. Other patterns of light are so integrated in local culture that they act as mediums for transmitting messages. Examples include lighting clusters consisting of linear elements that are formed above streets and in public spaces during national holidays or special days, such as the birthdays of imams. This installation method has been used more or less with the same patterns for more than fifty years. Regardless of the fact that it might seem non-homogenous or chaotic to people from other cultures, each lighting scheme communicates a message. For instance, a green light used to be

used in front of restaurants that served a specific food, Chelo Kabab, but the pattern is disappearing since this food does not belong to a specific class of people anymore and since green lights have represented a new pattern since the Islamic revolution. Green light became a prominent characteristic of mosques because in Islamic culture, green represents the descendants of the Prophet Mohammad. There have been other lighting patterns that have vanished for different reasons.

Figure 65: Hanging strings of lights have become a familiar pattern in most Iranian cities, especially in Mashhad- Source: author, 2018

In 2011, the Municipality of Mashhad started the first lighting master plan as a project in cooperation with a private lighting company3 (Municipality of Mashhad, 2011). When the project started, the city had already been celebrating with colorful LED lighting in many urban design projects. Some of the projects included lighting of urban structures and boulevards by the municipality (Figure 66) and commercial buildings run by the private sector (Figure 68).

Figure 66: Colorful lighting of boulevards' medians by municipality. Souice: author, 2018

When the mayor changed in 2012, the project almost froze since the new mayor, in opposition to the former mayor, was not in favor of a new wave of urban lighting projects for reasons that are not in the scope of this research. Because of cuts to the maintenance budget, some projects (mainly dynamic color-change ones) became quite chaotic. An instance of lack of maintenance can be seen in Figure 67 where lighting of one of the main transportation bridges (Sayyad Bridge) in Mashhad, which was supposed to have uniformly changing colors, became a display of randomly colored lighting.

Figure 67: Lack of lighting maintenance on Sayyad Bridge in 2012 (left and middle) and 2019 (right), Source: author

The transition between mayors highlighted a gap that had not been considered for the master plan project or the urban nightscape; light had become a medium of

transmitting messages to a mass of people. However, the people did not address harsh responses at these management issues for two reasons. First, seeing colorful urban lighting projects had become the new normal. Second, due to the lack of experienced experts in the field and maintenance costs, maintenance issues were also afflicting the lighting schemes of private commercial buildings. Two adjacent well-known buildings, the Kian Center and Hadish Restaurant, provide examples of private sector lighting schemes that have become chaotic due to lack of maintenance. (Figure 66)

Figure 68: Kian Shopping Center, a well-known urban node, and Hadish Restaurant are both equipped with color change lighting which has become a randomly colored scene due to lack of maintenance. Source: author, 2018

One unexpected outcome of deferred maintenance is that the chaotic colored lighting of Sayyad Bridge and some commercial buildings has become a new part of the city's collective memory and has the potential to become a trend. Designed, multicolor urban lighting projects, as seen in Figure 66, without judging whether they are good or bad, have same characteristics as the un-designed, chaotic examples in Figures 67 and 68. The municipality's decisions, together with maintenance issues, have developed into a visual culture that allows important private and municipal infrastructure landmarks to remain as they became because the public has not been offended by these images of their city.

Another attempt, before the change of mayor, was a call for ideas for public art installations that would be funded by the municipality for the Persian New Year (Nowruz) holidays. The main contractor was the House of Artists, a subdivision in the Urban Regeneration and Beautification section of the municipality (News.mashhad.ir, 2019; Bahar98mashhad.ir, 2019). Each year, some of the selected installations gain the chance to become permanent in the city through peoples' feedback and votes. Some installations receive permanent lighting design as well. These calls were continued after a one-year gap after new mayors became official in 2012 and 2016. As shown in Figure 69, some examples from March 2019 show how lighting has become an indispensable aspect of recent artwork. Almost all urban artwork, temporary or permanent, were accompanied by lighting for Nowruz 2019.

Figure 69: Urban metal statue, "Childish Dream," and the green light of the mosque in the background, , Source: author, 2012

Figure 70: Temporary public art installations in urban spaces during Nowruz, Source: Shobeir Mohammadyari, 2019

5.7 Flexible Use of Urban Space and Emergence of Night Markets

Night used to be luxurious because there was a high cost for it; time spent in the night had to be compensated from the next day's hours, which is energy-wise and function-wise more efficient. However, compactness of cities and concentration of populations have brought up a paradoxical aspect to this concept. The economy of a city or the way wealth is distributed, does not fulfill all dwellers' financial needs. Consequently, as a side-result we can observe formation of night markets as an alternative to daytime retail shops close to the shrine complex and in other parts of the city where certain classes of society – those that are not economically strong enough to buy or rent a shop – can sell retail goods at night. The formation of a similar concept was identified by Pottie-Sherman and Hiebert, (2013) in suburban areas of Vancouver, initially within Chinese and South Asian communities. The concept existed in the 24-hour areas around the shrine and recently it has been adopted and extended into other parts of city. These night markets are mostly active from 8:00 or 10:00 pm until 1:00 am and are constantly under surveillance by police. Some of these night markets take place in the same commercial pedestrian areas that are active during the day with permanent retail shops. Women and children are the most prominent participants in these markets, serving as both sellers and customers. This fact is an indication of a sufficient level of

safety and presence of gender-neutral urban spaces. Figure 71 shows two such night markets. From the macro-scale perspective, night has become even more valuable and has more potential in highly populated cities because it can be an accessible source of income for a big portion of society.

The night culture in Mashhad has got to a point that it is becoming productive in this regard. When new concepts emerge, if they are accepted by local culture, they have the chance to become part of local customs. For instance, there are organically formed 24-hour retail shops and eateries around the shrine complex that are very active. During an informal interview with an official building expert from the Ministry of Justice, the expert made the following comments regarding prices of retail around the shrine complex:

"It becomes a very sensitive situation when there is a court case about retail close to shrine complex. I had a case in Meydan-e Bargh[2] that had been open literally for 8years at the time of investigation. Less than six square meters of retail were the source of income for three families working in shifts over 24 hours. Some of them had not seen it closed at all during their rental period[3]."

[2] Meydan-e Bargh, literally means; Electricity Square, is the first publicly illuminated spot by electricity in Mashhad, very close to shrine complex.

[3] Ahmad Talebian, member of Mashhad's assembly of building experts - Ministry of Justice.

Figure 71: Danesh and Tabarsi night markets, Source: samesh.mashhad.ir

Night is also a source of time to spend with family. Time spent with family in public spaces can be extremely hard to acquire during the day due to high traffic loads, air pollution, weather conditions, and working hours. Therefore, the creation of 24-hour urban open spaces where various activities can take place at night is an important issue. With proper management, potential urban spaces, even leftover spaces, and brown fields can contribute to the safety, sustainability, and dynamism of a city.

Cherfaoui and Djelal (2019) referred to the temporal dimension and flexibility of use of urban spaces when they pointed out how changes in cities affect public squares: "... they host temporal, virtual and conflicting uses at different times. For these reasons, they must be multifunctional and adaptable to rapid and unpredictable changes to meet the users´ needs which change over time. These changes have repercussions on the planning and the development of these spaces" (Cherfaoui & Djelal, 2019, p. 164). A recent example of flexible usage of urban spaces is temporary 'food streets,' which emerged in Mashhad in the summer of 2019. These areas are identified by and equipped with lights provided by the municipality and they are utilized and rented by investors and small eateries. The food street documented below is happening between official buildings via the merging of plots that were active during the day but were previously empty at night. The one pictured located along Khayyam Boulevard, was

first defined in June and July of 2019. It was functional from dusk to dawn during Ramazan and reopened later in August due to positive feedback from investors. Now it functions from dusk until 3:00 am. As can be seen in the pictures, users include a wide range of families, youth, and elders.

Figure 72: Temporary food street formed in empty lots between high-rise official buildings along Khayyam Blvd. Left: 1:00 am, Right 3:00 am. Source: author,2019

Night markets and food streets in Mashhad are very similar to the definition of Night-Time Economies (NTEs) as defined by Liempt, Aalst, and Schwanen (2014). NTEs are an “assemblage of bars, clubs, cinemas, theatres and cultural festivals and events at night which are, in a context of urban entrepreneurialism supposed to contribute to urban regeneration and local economic growth.” However, ‘McDonaldisation’ and standardized experiences supported by big brands, as considered a critical concern by Hollands and Chatterton (2003),has not happened in Mashhad yet. Small retail shops around the shrine complex, which have the most expensive rents in the city, offer diverse options and are mostly run by local people can be considered as `unmarketed cultural spaces' as defined by Klein (2000, p:45) Night markets and food streets are even more in favor of small yet diverse economies.

Alcohol consumption and related anti-social behavior have become a critical concern in the night-time management of public spaces in the Western context. Robert and Turner (2005) called attention to the depression of desire of any social group, other than youth, to go into city centers at night. Roberts (2006) emphasized alcohol-related disorders caused by related night-time economies and how the 'binge drinking' habit and how 'binge drinking' habbit and creation of 'no-go areas' have made British town centers out of control. Eldridge (2010) pointed out the contrasts between a desirable, safe, and comfortable city center at night and alcohol-related problems such as violence, fear of crime, and public urination. Meanwhile, the study by Valentine, Holloway, and Jayne (2010) pointed out the exclusion of Muslim youth from the night-time economies of some city centers due to their culture's abstinence from alcohol. Finally, Liempt, Aalst, and Schwanen (2014) concluded that "Discourses of disorder, anti-social behavior and the 'alcoholisation' of urban nightlife constitute a danger for any city that wishes to appear as an innovative, exciting, creative and safe place in which to live, visit, play and consume."

In Mashhad, prohibition (at the national level) of alcohol consumption seems to be one of the reasons for the increased perception of safety, and consequently, the wide-spread use of pedestrian areas by families. Specifically, in Samen District, vandalism, violence, public urination, gender and age exclusion associated with excessive alcohol drinking (Hobbs et al., 2000) are not critical issues at all. Safety and perception of safety together with other socio-cultural routine activities have minimized the gender, age, and class barriers for spending time in public spaces during the night. This might be a direct result of constant surveillance of high numbers of users which act as "mechanism of social control" as defined by Williams (2008). This condition was observed and documented by photos taken around the shrine and in the night markets

and food streets. However, the problem is not fully solved; the alcohol drinking habit has shifted from public areas to private and semi-private spaces, including cars. Thus, drinking alcohol remains a part of the new night-time culture, resulting in unsafe streets and a high number of car accidents. Research on driving behavior in Mashhad confirmed a high rate of alcohol-related accidents (Mousavi Bazzaz, et al. 2015). Drinkers, in most cases, use private cars over public transportation to minimize interaction with people and reduce the risk of being caught by police. As a result, the culture of drinking and finding mates, which usually happens in bars and clubs, has been partially transferred to moving vehicles. This is creating a new way of interacting in public spaces, cruising at night beyond the limitations of Islamic rules. =

5.8 Area of Influence of Lighting on Livability

The influence of urban lighting on livability based on previous and extended theories is reflected as an assessment framework in section 5.2. – Table 8. This framework can also be used for evaluating effects of urban lighting on other cities as indicators provided are applicable to any case. Depending on the case some items might be deducted or added to current checklist, however, majority of indicators are expected to be applicable in all cases.

The table below (Table 9) identifies the area of influence of nightlife on livability in the case of Mashhad. Columns in the middle of table; Indicators and Descriptions, define what aspects of urban lighting are considered in detail. Columns on the left clarify how each indicator is related to livability and columns on the right depict the result of each indicator in the case of Mashhad and the proposed method for data collection.

Table 9: Area of Influence of Urban Lighting on Livability - case of Mashhad					• Data collected in current research ⊗ Needs additional data								
					Data collection method					Data representation method			
Livability dimensions	Sub-dimensions	Indicators	Descriptions	Instances in Mashhad case	Library / internet research	Field study / Observation	Official statistics	Questionnaire/interviews		Visualization by map, picture, graph	Percentages / numbers	Cellular Automata	Written in text
Health	Physiological wellbeing	Availability of medical facilities at night	24/7 hospital/health services	24/7 health services are available in public and private hospitals		•	⊗						
		Availability of sport facilities at night	Basic outdoor gym facilities in public spaces	Basic gym facilities are available in all public parks and some public passages		•				•			
			Illuminated and functional jugging and bicycle paths	Bicycle paths are not fully functional. Women's use of bicycle paths is restricted. Jogging at night is not considered safe in most parts of the city.		•		⊗		•	⊗		
			24-hour indoor sport facilities such as gyms, swimming pools, sport salons	Most indoor gyms, swimming pools are open until midnight 12:00 One month per year (Ramazan) all become 24/7	•	•					⊗		
		Loss of darkness (sensorial) Excessive light intake surpasses melatonin production in brain, weakening body's immunity system Darkness limits vision and provokes other senses, excessive illumination without preserving urban dark, semi-dark areas surpasses other senses rather than vision	Dark and semi-dark areas in urban nightscape	Torghabe and Shandiz service cities have many dark and semi-dark nightscapes however, within border of city urban dark areas are mostly lost. There are few un-illuminated vast areas which can act as refuge for wildlife, but edges that are in the field of view of human are mostly lit.		•				•			
			Light trespass trough residential windows caused by streetlights and façade lightings	Traditional streetlamp casts emit upward light which brings up the trespass possibility, however, big trees in older neighborhoods act as a barrier. Replacement of traditional streetlamps with downward directed LED lamps is the solution which is done in few rare occasions. Façade lighting of adjacent buildings cause light trespass at night		•		⊗		⊗			
	Safety	Crime rate Safe public spaces	Illuminated streets and public spaces reduces crime rate by decreasing hiding spots for offenders while increases possibility of facial recognition	Diverse use of Shrine complex and it surrounding, which is the most bright spot in Mashhad, by families and female users at night confirms safer public space compared to other parts of the city.		•	⊗			•	⊗		•
Socio-Culture	Recreational and attention restorative opportunities	Being in close proximity to natural environment Possibility of outdoor activity in less polluted air condition Leisure activities	Illumination of urban greeneries Changing the focus of light to greeneries instead of hard surfaces wherever applicable (Parking lots)	Greenerioes in boulevard medians, roundabouts and sidewalks are illuminated in almost all first-degree accesses and mostly in second-degree accesses.		•				•			
			With the help of lighting existing urban spaces can host leisure activities at night	Emerge of nigh-markets and food-streets in parking lots, parks and passages	•	•				•		⊗	
			Illumination of publicly available natural resources such as seas, lakes, gardens, and/or adjacent public areas	Kouhasngi hill which is a touristic attraction on border of the city is illuminated. No other natural resources available within city borders.		•				•			

		Restorative environment and recreational activities; possibility of distancing person's attention from daily routines (being away) or get their effortless attention (fascination), and supports people's intended activities (compatibility)	Illuminated restorative natural and built environment Illuminated public/private landmarks act as ornaments of nightscape, hence as a soft entertainment tool for both pedestrian and vehicle users	All parks are open and lit at night		•			•		•	
				Torghabeh and Shandiz service cities are popular night-time destination in natural environments								
				Shrine complex, bridges and crossovers and high-rises are mostly illuminated.								
		Nightlife Psychological relief of pressures Reduction in fear, stress and sadness	Illumination of public landmarks instead of private buildings	Except shrine complex, most illuminated buildings are private organizations, banks or residential high-rises.		•			•	⊗		
			Lit streets and pedestrian accesses	Streets are not generally considered safe at night specially for women and children except around shrine complex.		•	⊗	⊗		⊗		
			Surfing the city at night as a leisure activity	Numerous illuminated sites and landmarks have made surfing at night by car as a common habit		•						•
			Having a place to go at night	Many aretails, eateries and seasonal recreational opportunities such as water parks are open until 2 am or later		•			•		•	•
	Social and mental wellbeing	Safety, Security, Fear of crime Number of crimes and incidents at night fall during festivals and public events Sense of place is increased by festivals and urban celebrations Incrementing safety of public spaces by increase in number of natural collective surveillances/observers. Illuminated pathways increases perception of safety Visibility of paths and accesses reduces stress	Perception of safety increases in illuminated urban spaces Increased number of users reduces fear of crime due to natural surveillances/observers	Shrine complex and its surrounding seems to be considered safe by users due to high level of illumination and continuous presence of users and shop keepers		•	⊗					•
			Number of public festivals/events and active nights per year	Nowruz (1), Chaharshanbe soori (1), Qadr nights (3), Ramazan month (30), Ashura and Tasu'a (2), Yalda night (1) Birth of Imam Reza and Ali and Profit Mohammad (3) Total= 41 nights per year			•			•		•
			Availability of educational opportunities	Goharshad library is the only 24hour open library in Mashhad. Users are limited to theological students.	•				•			
		Cultural identity and sense of belonging Urban lighting creates a strong city image Sense of belonging to a larger group Public and private space that help foster a spirit of community	Vibrant social interaction at night and being in a crowd of people (group ecstasy) Vibrant nightlife can boost cultural identity Common public experience that forms a sense of belonging to a group and/or boosts cultural identity through collective (or cumulative) public events such as concerts, festivals, religious events/rituals Visual or cognitive channels such as national/religious landmarks	Being in a city that is known as city of light and have active nightlife boosts cultural identity of city and its dwellers. A person can have public experience of joining the crowd in open, semi-open or closed public spaces of shrine complex any time at day or night. *Non-religious dwellers may not feel attachment hence not attend public experiences in shrine complex	•	•		⊗		•			•
				Recognizable nightscape (city image at night) composed of illuminated high and mid-rise buildings, iconic buildings, urban structures, public arts and greeneries		•		⊗					
				Imam Reza as an important figure and his shrine provides a strong cultural identity for the city and has provided an interlocking cognitive bound for many dwellers and visitors by means of rituals and customs throughout the history.		•			•			•

	Diversity	Multi-cultural environment Ethnographic diversity (Age, gender, culture) Diversity of activities and functions	Diversity of Illuminated landmarks to relate to various backgrounds (educational, national, historical, financial, cultural, religious and monumental landmarks)	Wide range of landmarks are illuminated including cultural heritages, banks, residential and commercial buildings	•	•					⊗		•
			Possibility of being in contact with people from different age, gender and cultural background	Due to presence of national and international tourists, elders, women and children from different cultures within Iran's cities and neighbor countries are present in and around Shrine complex. Torghabe and Shandiz are also used by mixture of families and youngsters although users at night are mostly youngsters	•	•		⊗					•
			Possibility of attending or having the option to choose between variety of activities	Except religious activities available functions are mostly recreational activities such as eateries and teahouses and waterparks in summers. Educational and sport activities are missing at night		•	⊗			•	⊗		•
Economy	Income	Absorbing tourists and foreign investments Income opportunities	Direct investment from other cities/countries in forms of buying lands, starting businesses and any other clues that reveals investments have been made by non-locals especially in 24hour economies Illumination of landmarks boosts positive city image and absorption of tourists and foreign investments	Investments in forms of hotels, hostels and restaurants from Shia population of Arab countries including Iraq, Kuwait, Afghanistan is dominant High income of Astan-e Qods (organization running the shrine complex) is verified by lending money to central government of Iran	•	•	⊗				⊗		•
			Since tourists are free of working hour routines, any form of 24/7 active areas are popular touristic attractions	Very high prices of retails in Samen districts and 24/7 retails verifies high income of 24/7 areas		•	•						•
	Employment	Flexible working hours, Providing job opportunities for mid and low-income group	Authorities' approach toward vendors and night markets (Relaxation of regulation regarding use of public spaces for vendors and night markets) Extended open hours regulations Availability of night-markets	Extended open hours throughout the city, private 24/7 transportation providers and seasonal night-markets provide income opportunities specially for low-income group Small retails in Samen district are sources of income of two-three families working on shifts	•		•						•
Infrastructure and Legibility	Accessibility Legibility, Protection of natural resource	Accessibility of 24/7 activities Nightmap: Diverse and unique lighting on building or urban structure helps orientation and recognition by differentiating districts (specific color, visually unique approach toward buildings, specific lighting fixtures)	Availability and accessibility of active nodes at night by foot and vehicle	Pedestrian accessibility; 33.1% Vehicle accessibility; population/active nodes; 3,001,184/513= V.A.=5850		•				•	•	•	
			Visually rich cityscape as a potential for cruising the night with vehicles as a recreational activity Illuminated landmarks makes the city more readable Cityscape as a sight worthy of respect, even admiration	Lighting of bridges and urban infrastructures by different colors and technics have made the city more readable at night and easier to navigate Illumination of buildings and urban greeneries have provided distinction of districts, streets by visual features "dor-dor" is Persian pop-culture equivalent for surfing by car at night has become a common habit for youngsters Urban lighting is recognized and praised by dwellers		•		⊗		⊗			•
		Reduction in transportation/commuting by accessibility of facilities within walkable distances Flexible use of empty lands and parking lots without extending urban footprint	Active nodes at night in the scale of districts increases accessibility by walk and reduces in-city travels Flexible use of empty lands as night m ood streets can be achieved by providing light in potentia urban public spaces boosts land value	Seasonal night-markets and foodstreets Accessibility rate to active nodes at night are mostly high, especially in Samen district		•				•	•	•	•

	Light pollution and energy consumption	Lowering consumption of energy Sky glow and disruption of circadian cycle	Use of LEDs for street-lightings which holds majority of electricity consumption of city at night	LEDs used in recent urban lighting projects and lighting of recently developed parks Majority of street lamps are mercury lamps		⊗	⊗				⊗		
			Downward cutoff streetlights Effective regulations on façade and urban structure lightings (downward illumination sources, controlled or no upward lights)	No effective regulations are applied		⊗	⊗				⊗		
			Light trespass on residential windows	No effective regulations are applied		⊗				⊗	⊗		

5.9 Mapping Mashhad's Nightlife

Documenting activities, users, functions and holistic image of cities' urban night can be achieved by collection of written texts, pictures, graphs and maps. While previous sections provides information about existing situation of Mashhad regarding urban lightings and urban nightlife, following section is an attempt to reflect those activities and presence of users at night on a map that can act as a basis for further investigations.

5.9.1 Rules applied

To be able to apply cellular automata we defined each cell an active node as defined in previous chapter (section 4.3.1), a single active spot which could be either night-time economies like markets, kiosks, fast-foods, drugstores and retails or parks that gives services beyond their containing districts in the scale of city.

Each node is a 50m*50m square cell transits through neighbor cells by the law of transition of light which is called The Inverse-Square Law; brightness is inversely proportional to the square of the distance.

$$\text{intensity} \propto \frac{1}{\text{distance}^2}$$

Where the P is the luminosity of a source which emits light in all directions, r is the distance from the source to the point where we want to calculate the source's brightness. Since the surface area of a sphere of radius r is $A = 4\pi r^2$, the intensity I (power per unit area) of radiation at distance r is calculated by formula below (E. Barnes, 2013).

$$I = \frac{P}{A} = \frac{P}{4\pi r^2}.$$

Primary brightness of cells are adjusted by Photoshop to reflect brighnesses recorded by luxmerter at eye level on each node, divided by ten, which holds a number between zero (completely dark) and 2550lux/10=255 maximum readable in digital imagery. For instance recorded level of 600 lux in front of a kiosk is reflected as 60/255 bright cell. (Figure 73)

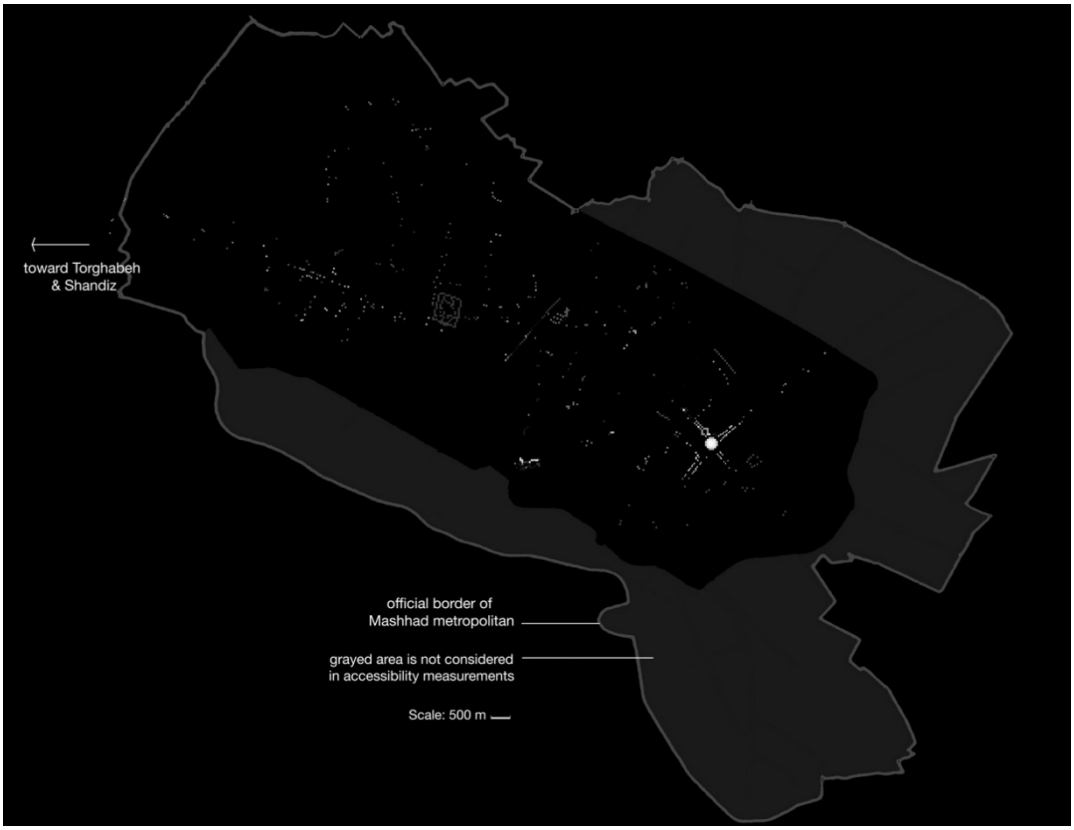


Figure 73: Distribution of nodes before application of cellular automata

Pictures below (Figure 74,75,76) show the first attempt to apply cellular automata on a pilot area of almost a quarter of the city, including Shrine complex, Koohsangi park and two districts.

Figure 74: Pilot area of investigation including most important node of shrine and three districts - Map provided by google map 2020

Figure 75: Location of active nodes in pilot area reflected by level of illumination before application of cellular automata - Figure by author

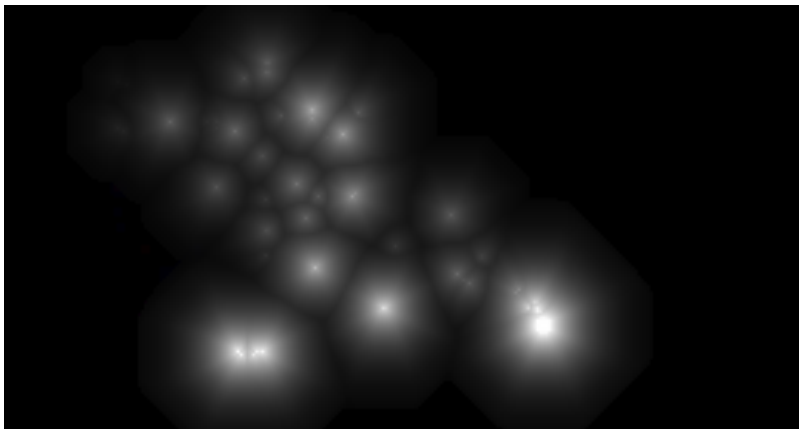


Figure 76: Application of cellular automata on pilot area shows area of influence of active nodes as bubbles after 23 generations – Figure by author

5.10 Mashhad's Nightlife Map

After testing the cellular automata on a chosen parcel of the city, the result was found to reflect night-time geographies and the same rule was applied for the whole city. Following steps proceeded to apply cellular automata to the whole city's active nodes;

1- The distribution of active nodes at night during the field study is reflected on the first map below, which includes night-time economies, plus, illuminated parks with at least one active node around them and hosting active users.

2- Next, this map is inverted to a bitmap image and resized to the point that each node became the size of one pixel. (Figure 77, no.1)

3- Resulting bitmap image is inserted to cellular automata program which can read pixels of bitmap image and apply our defined rule to each pixel.

4- Program generated the rule on provided map 100 times. Results can be seen in Figure 77 after 4 generations (no.2), 8 generations (no.3), 12 generations (no.4), 22 generations (no.5) and 32 generations (no.6)

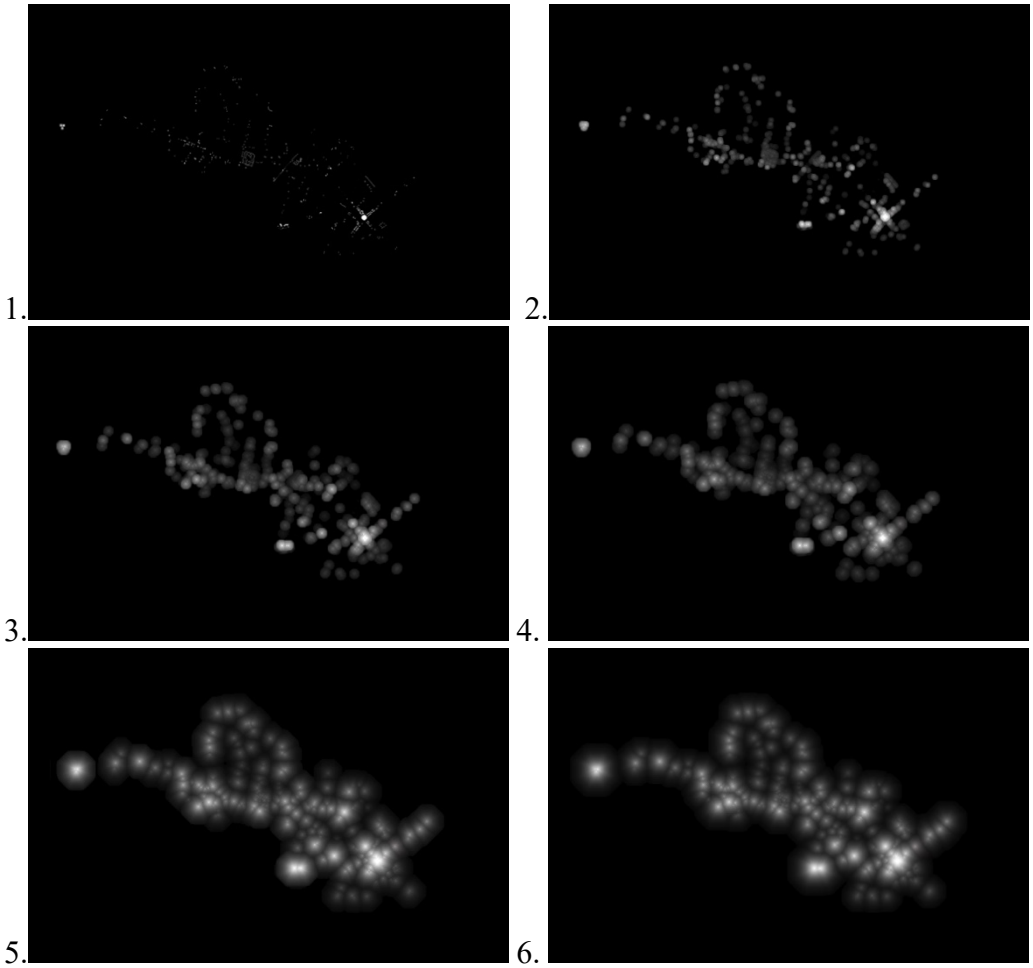


Figure 77: 6 Steps of applying cellular automata on Mashhad's primary night map

After 22nd generations the speed of change becam slower and after 52nd generation growth stabilized and cellular automata appeared to have no observable further effect on the map. (Figure 78)

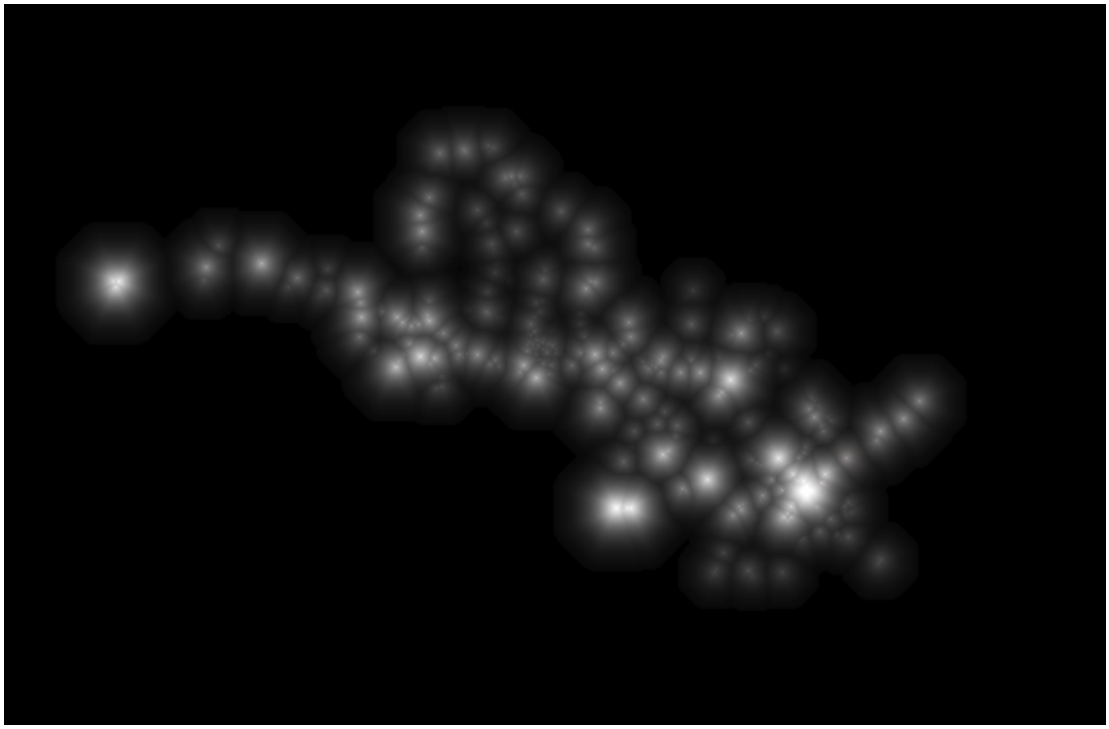


Figure 78: Raw result of cellular automata applied to city's active nodes after 52 generations

The following section provides a set of city maps and an overlay of the night-map on the existing masterplan map of Mashhad. Comparing Mashhad's night map with the city's historical development gives us clues about the relation of historic sites and nightlife. While the historic core is highly active at night, first phase of expansion of city during modernization based on Mashhad's first master plan (Figure 79 and 80) is more active and contains more active nodes than recently developed areas. Figure 81 shows latest masterplan which was approved in November 2020 and Figures 82 and 83 shows essential information about structure of city including city's ring-road, dark areas, airport, central train station, parks that are accountable in the scale of city and location of Torghabeh and Shandiz service cities that act as popular nightlife destination. Figure 81 contains the night map, city borders and an active paths that can be identified starting from train station and ending in Torghabeh. Figure 84 is the overlay of nightmap on latest masterplan.

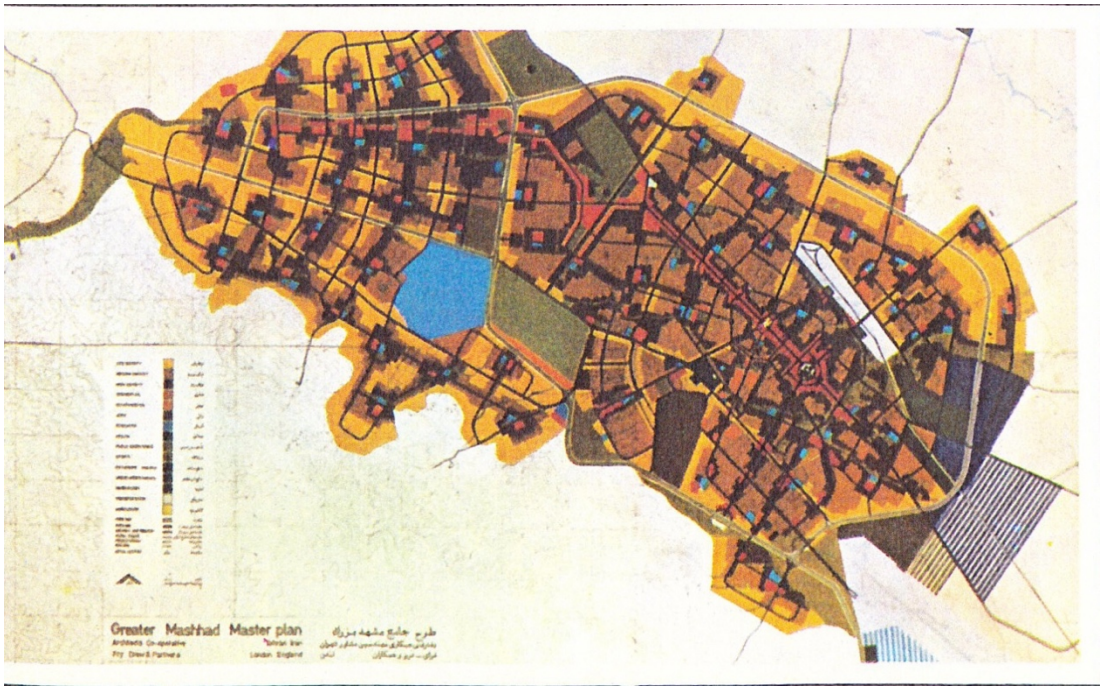


Figure 79: City's 1975 master plan by Supreme Council of Urban Planning

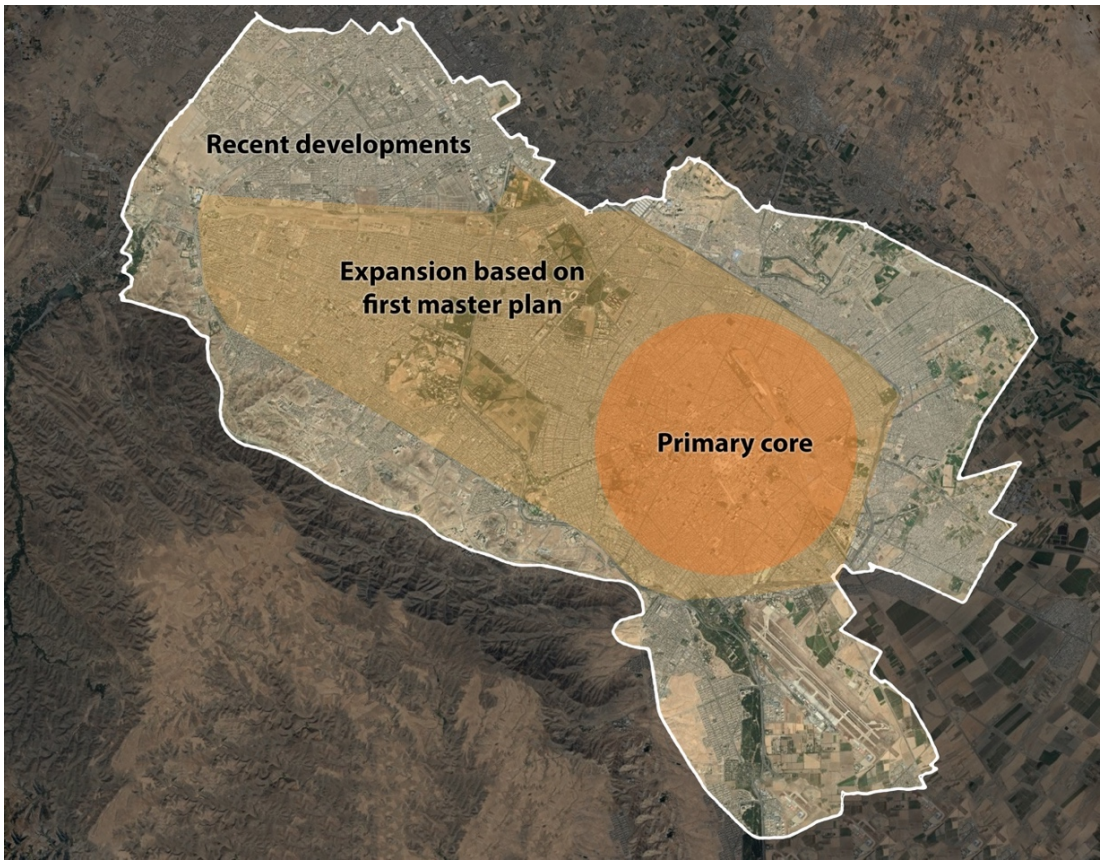


Figure 80: Historical development of Mashhad, Source: Author

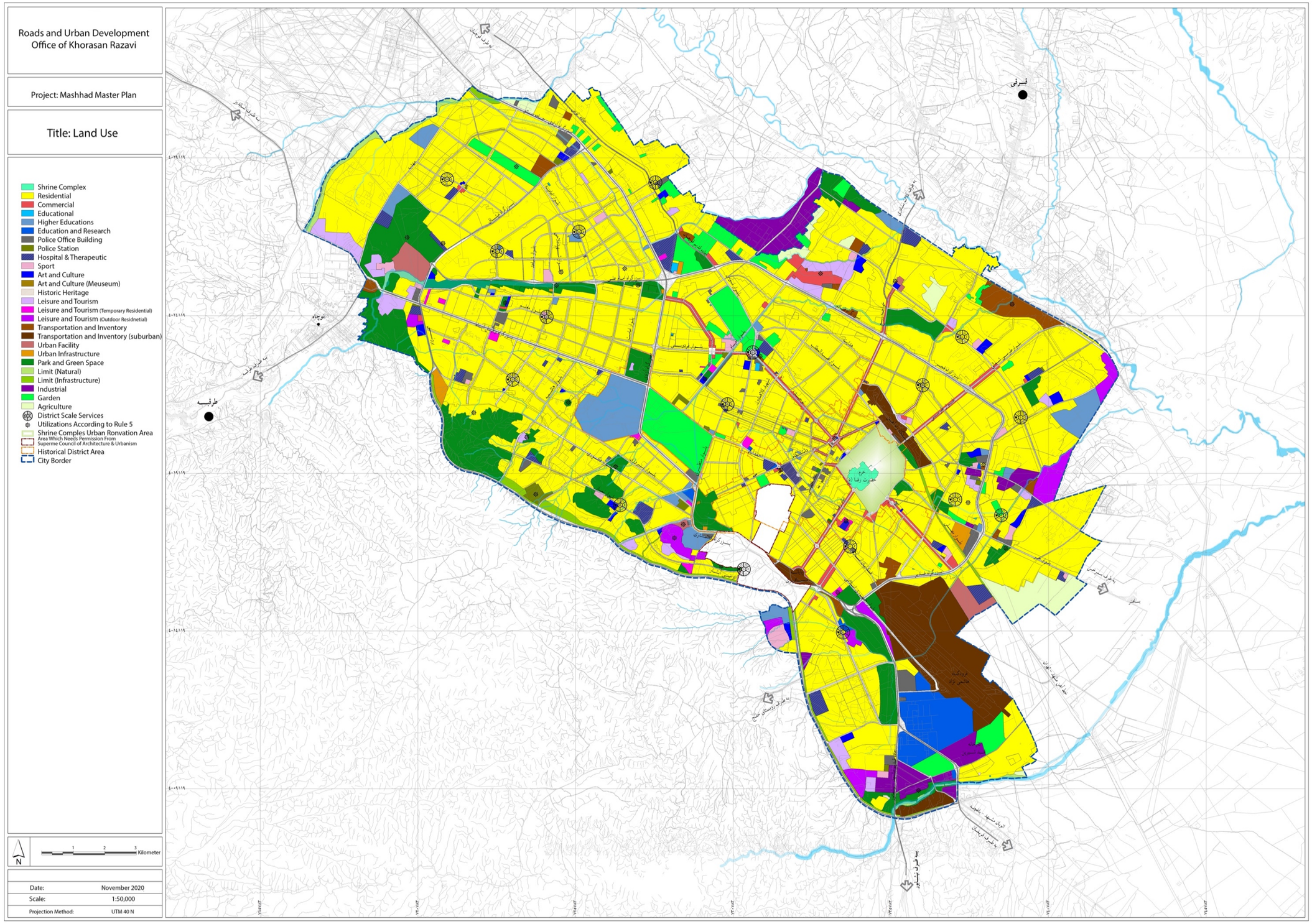


Figure 81: Mashhad's masterplan approved in 2020, Source: Roads and Urban Developement Office of Khorasan Razavi

Figure 82: City's ring-roads, airport, train station and parks and dark areas in the scale of city. Source: Author

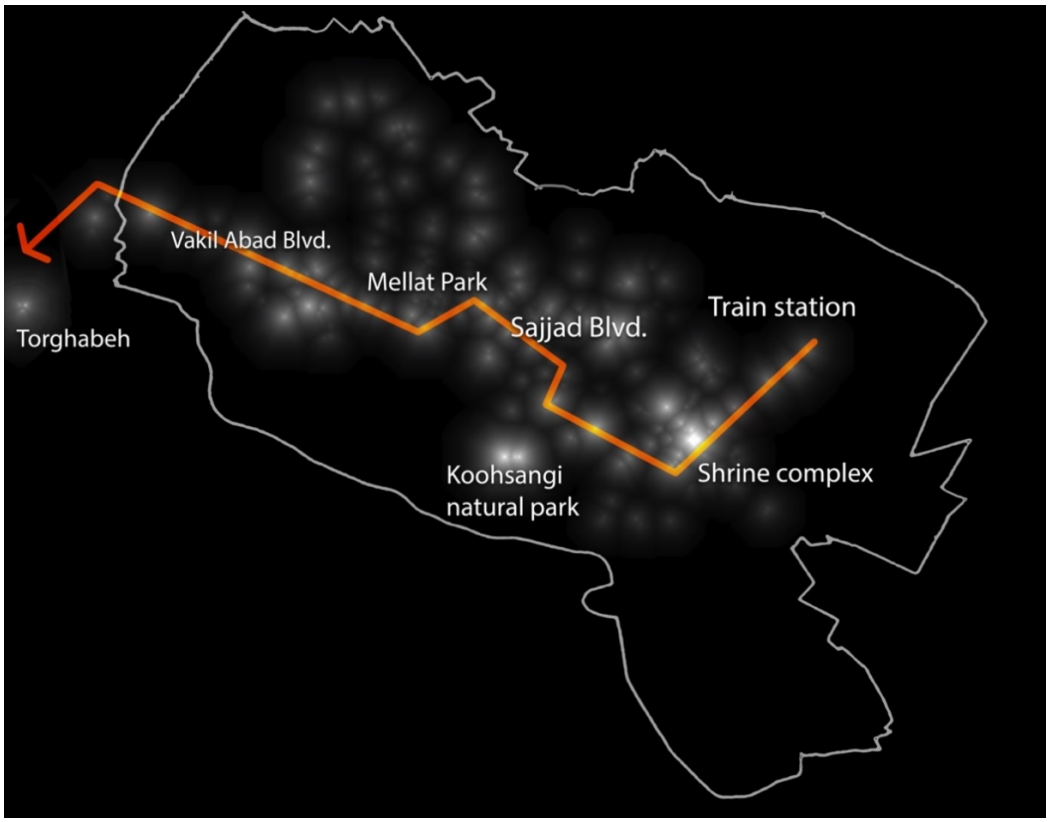


Figure 83: A strong path can be identified starting from the train station, connecting popular landmarks and finishing at Torghabeh. Source: Autor

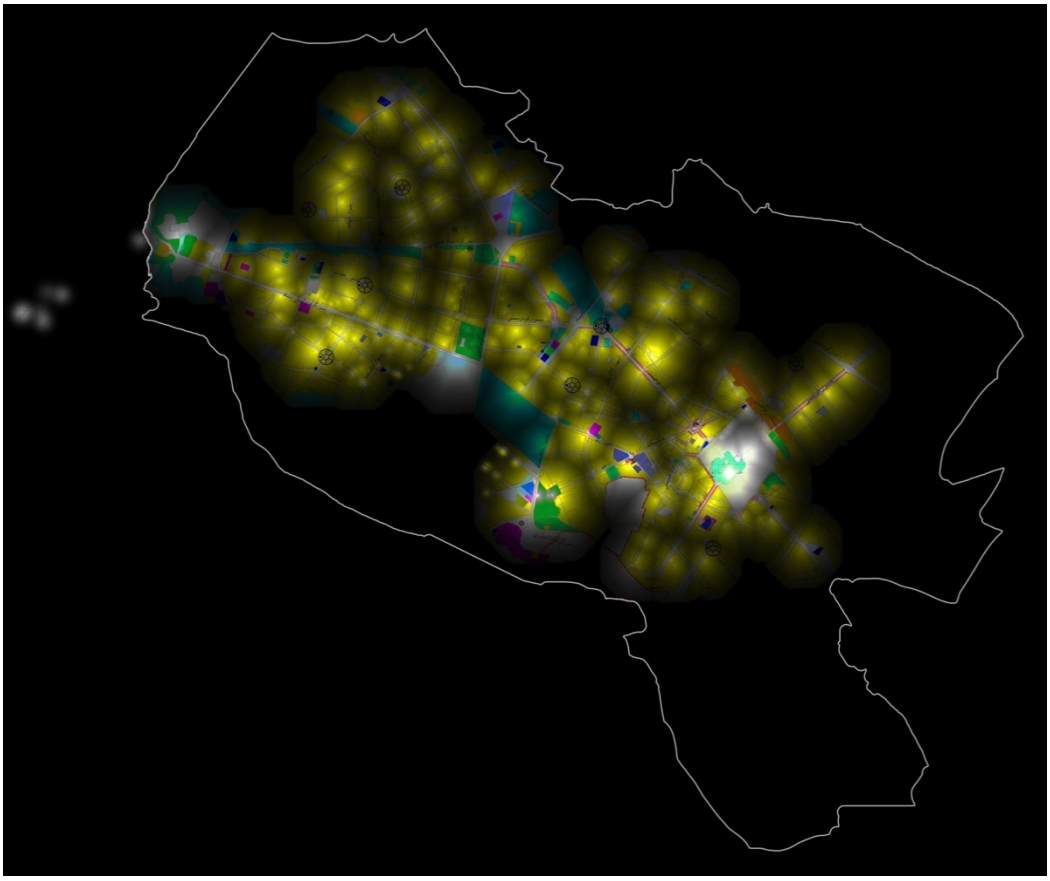


Figure 84: Night-map overlay on land uses of master plan, Source: Author

By placing the night-map on the masterplan map and google map following results could be extracted;

- Although ring-roads hold relatively high 24/7 traffic, no direct relation could be found between between them and level of nightlife activity.

- There seems to be direct relation with level of nightlife activities and oldness of urban districts. Level of activities falls dramatically by getting distance from the historic core toward recent developments.

- Touristic areas including shrine complex, Koohsangi natural park, Mellat Park and Toraghabeh and Shandiz service cities are highly active at night.

- Nightlife seems to be expanded through the axis (Vakil Abad blvd.) between highly active areas of Samen district (shrine complex) and Torghabeh and Shandiz.

- In the overlay of night map on the last master plan (Figure 84) it seems that most nightlife activities are taking place in residential tissue. The fact that singular retails and shops, even though in some parts they are dense and connected to each other and form a solid commercial zone, are not reflected in the master plan despite the fact that the master plan can not entirely reflect nightlife potentials. For instance, the highly active Vakil-Abad boulevard consisted of singular active nodes that form an illuminated line toward the west, mostly reflected by residential land use in the master plan. This issue also confirms the edge of high traffic roads which are close to residential tissues are highly potential for formation of nightlife as they are accessible and visible both by vehicle users residents in the neighborhoods.

- Central train station seems to be a potential 24/7 spot, however, when it is close to a more critical active area as in case of Samen district of Mashhad it acts as a service to the 24/7 life and around the station is almost empty of activities except toward the shrine.

- No significant nightlife is formed around the airport.

- Although university students are in favor of night-time activities, the campus itself is not an active hotspot at night.

- Seasonal natural resources of Mashhad (water canals) are not potential hotspots in contrast with permanent natural resources (Kouhasngi Park and Torhghabeh area) which are highly active at night.

– Parks usually form a kind of 24/7 activities around them while any form of private and semi-private gardens act as dark areas in the nightscape as well as a refuges for wildlife

5.11 Nightlife Accessibility Indicator

Investigation of accessibility of nightlife in Mashhad brings us to the point to be able to define 'Nightlife Accessibility Indicator' which can be considered in livability assessment. The method of calculation is explained below.

The walkable area is defined in sources between 400 and 800 meters depending on the age, race, and purpose of walking. (Dovey and Pafka, 2019) Considering lowered visibility, safety perception issues and leisure nature of night-time economies we have considered low threshold of 500 meters as walkable distance at night, so each node is accessible by area of a circle by one kilometer in diameter.

Figure 85: Area of coverage by a short walks (500 m), Source: author

Figure 85 represents accessibility by foot. Each node is considered as a one-kilometer bubble around center of an active node which can be accessed by a short walk. With the help of Autocad software, we can calculate the total area covered by these bubbles

and the total area of investigation. By comparing the area covered by bubbles to the total area of investigation, it is concluded that 33.1% of geographical locations within the city have access to at least one active node in less than 500 meters.

-Pedestrian Accessibility (accessibility to at least one active node at night): P.A.=33.1%

The primary map (figure 73) and cellular automata result (figure 78) reflect identified 513 active nodes on Mashhad city's map. The shrine complex is identified as the brightest area. Hypothetically these nodes can act as a potential destination to be accessed by vehicle. Considering the population (3,600,650 residents in the metropolitan area according to 2016 census) and dividing it by the number of active nodes (513), we come up with the number of potential users (among residents) per node (7018). A relatively smaller number shows that there are more options available per person. In the case of Mashhad, since the number of visiting tourists is very high, this indicator is measured once more considering the total number of residents and tourists (approx. 20 million) together;

-Vehicle Accessibility Residents: population /active nodes; 3,600,650 /513= V.A.R.=7018

-Vehicle Accessibility Total: population + tourists /active nodes; 28,600,650 /513= V.A.T.=55751.754386

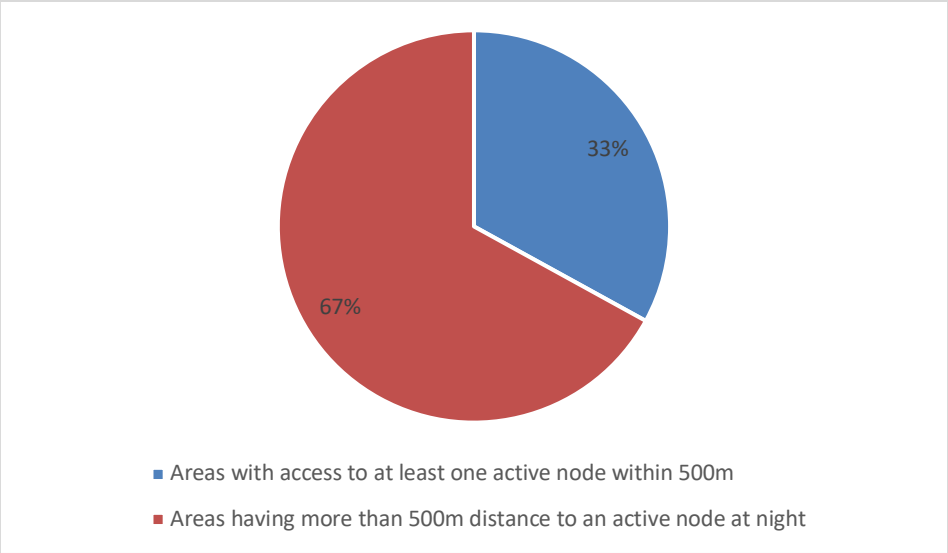


Figure 86: Pedestrian accessibility of active nodes at night for Mashhad city

It is noted that by getting close to the borders of city number of active nodes fall slightly while number of illuminated buildings that are not necessarily active during the night increases. Figure 87 shows examples of buildings that are located on the border of the city toward the road that leads to two service cities: Torghabeh and Shandiz . Both are highly popular destinations in close contact with nature (river and gardens) with an active nightlife , known for restaurants and teahouses that serve hukka as well as private recreational properties and gardens. On the left picture there is an active fast food at 1:55 am while the tall illuminated building is actually closed at night. The illuminated building in left picture is an example of many big-sized one or two story buildings that are mostly furniture companies or related resells that are closed at night but use façade lighting as a branding strategy. The size and language of urban lighting features in this area matches with the utilization of urban structure as a vehicle access.

Figure 87: Facade lighting on buildings on the border of the city toward Torghabeh and Shandiz service cities

5.12 Summary of Chapter

As discussed in section two weather conditions, ideological and cultural backgrounds of society and financial power and intentions of city governors form three essential agents in the formation of a lighting culture that shapes and visualizes the night phase of cities. In the case of Mashhad, among all variants, ideology, and in a broader sense, the belief structure seems to play a crucial role in the formation of the city and its night phase. Although religion is supported by authorities as a “narrative of integration” pursued by authorities (Madanipour,1999, p; 59), it is essential to acknowledge the strong influence of Mashhad on the financial and political structure of Iran, and the fact that this power is mostly made by the people themselves by directly dedicating money, lands, and foods, as well as free services in the form of endowments to the shrine complex. Mashhad is a physical and social representation of the deep belief of a majority of Iranians in a superior power, a reflection of the whole country’s governing structure.

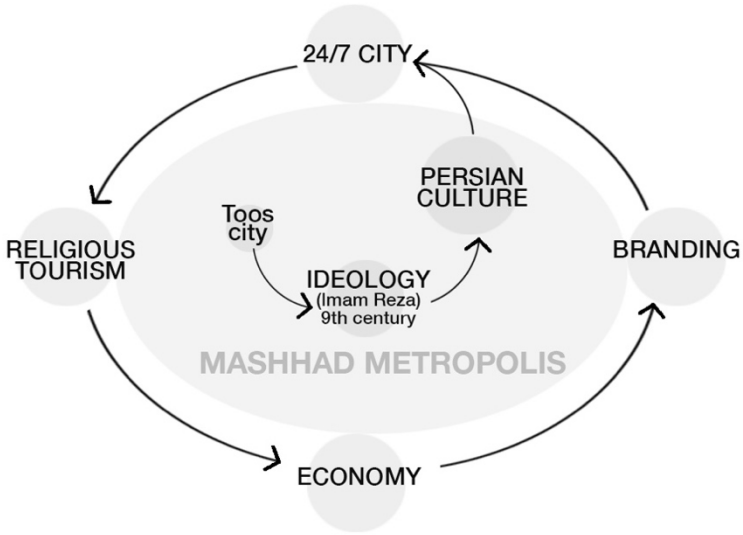


Figure 88: Formation of Mashhad and current agents running the city

We reviewed the financial and social aspects of how light was originally perceived as a secondary element, subordinate to the belief structure. However, this status has changed. Mashhad is not just a *city of light* anymore; it is becoming a *city of lights*. Excessive exterior lighting of buildings, urban structures, and more recently, apartments, together with the municipality's encouraging laws to persuade builders to add exterior lighting have broken the city's semantic relationship to light and light's previous sanctity as a reflection of a spiritual source of well-being and life. Although this phenomenon forces the transformation of the city into a city of lights more similar to Western examples, the extension of the concept of 24-hour light to the whole city can also be seen as development of the original identity of a 24-hour city at the national and international scales. Also, from economic and identity points of view, these waves of new lighting can play a significant role in attracting tourists and investments from beyond the boundaries of the city while increasing the sense of belonging by empowering the cultural identity of residents.

It seems that population growth automatically pushes the flow of night-time users into urban spaces and nightlife paves its own way with or without supervisors and governors. While 24-hour activities seem to be an indispensable aspect of many cities, having 24-hour public urban spaces needs the support of organizations or governmental bodies to provide safety and infrastructure. As an example, Mashhad is highly active during the night, despite not having a night mayor, because the night is integrated into the culture and landscape. On the other hand, although Tehran, the capital of Iran, has a night mayor, it does not have the same kind of nightlife as Mashhad. Instead, Tehran's night mayor is mainly responsible for supervising activities related to repair and maintenance of streets and urban infrastructure that cannot be performed during high daytime traffic loads but they can occur at night because of restrictions to urban nightlife.

These restrictions in Tehran are mostly related to business hours and security concerns. After waves of protests related to the 2009 presidential election, governmental bodies restricted the open hours of businesses to midnight in order to control continuous gatherings in public spaces. Although there were similar protests in Mashhad at the same time, night-time usage restrictions never became operational there because they were in such contrast to the city's culture. In 2019, the restrictions were still valid in Tehran, and the battle was carrying on between the municipality of Tehran and national security agencies. Although Tehran's municipality defined five districts to grant permission for 24-hour activities, as of September 2019 the police of Tehran still rejected providing security after midnight (News.mashhad.ir, 2019; Khabaronline.ir, 2019). Therefore, night-time outdoor activities after midnight are limited to cruising Tehran's urban spaces in private vehicles which, once more, brings up the necessity of investigating the urban nightscape from the point of view of vehicle users.

Amid (2013) pointed out a reduction of night-time activities in modernized areas of Mashhad during her research. Although this statement was factually accurate, it seems after the passage of several years, some of the earlier activities are resurging in new forms. For instance, the popular culture of pedestrians shopping and browsing urban spaces at night is now being done from the seats of moving vehicles.

Similar to traditional ways of transmitting information about being open or serving a special food by using light, nowadays exterior light displays on building façades can provide information about ongoing activities inside the building or at nearby public spaces. However, current urban lighting conditions send a mixture of confusing information about the availability of activities or events, especially for cases like banks and similar landmarks that are not open or active during the night but have elite façade lighting. In Mashhad, the passive visual interaction of users at night, or as Virilio (2019) described it, new 'aesthetics of movement' and 'aesthetics of disappearance', has come to a point that is transforming the whole city into an entertaining cinematic experience for vehicle users.

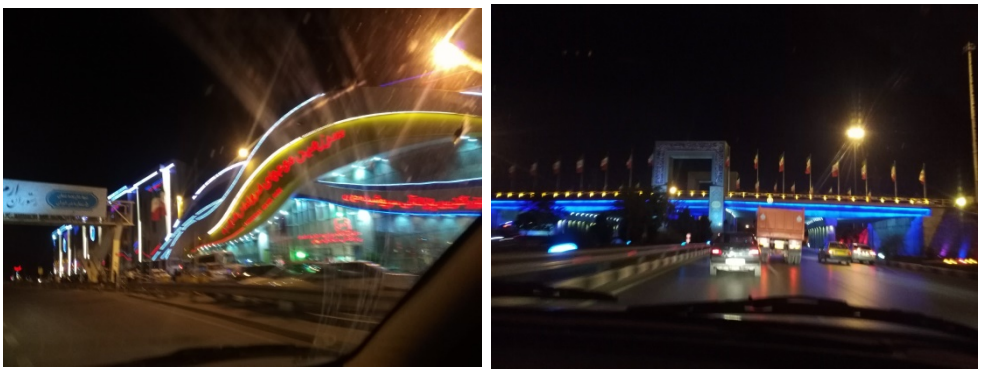


Figure 89: Façade lighting of a water park (left) by the private sector and Qadir bridge on right by the municipality. Both are meant to be seen from a vehicle users' point of view. Photos by author, 2019

Considering the studied district in Mashhad as an example, an alcohol-free zone within the public urban spaces of European cities may help attract a range of users that felt excluded from public spaces during the night due to their beliefs, personal experiences, gender, age, or fear of crime.

It would be really challenging to distinguish between lighting and functions since these aspects act together most of the time. Considering lighting in urban spaces outside the context of other variables of nightlife is like trying to address the public's attitudes without considering their roots and their differences. Lighting plans need to be considered as one variable of the broader context, the 'urban night' where financial, political, and cultural factors play crucial roles in the utilization of urban spaces. Public opinion plays a crucial role in the endurance or discontinuity of such projects at the scale of a city. However, by educating the public about urban lighting and attracting participation and cooperation of both the public and local authorities in the process, we can and should recommend the idea and the knowledge of having a desirable nightscape to the public. Repeated and powerful public announcements regarding the subject of urban lighting can also advance the educational effort. When the topic gains the support of public opinion, a change in leadership will be much less capable of interrupting the project's rhythm because the people and experts will demand it from authorities in alternate ways. Hence, educating the public and involving a public media expert may help shape a reasonable public image of a lighting master plan project and increase the depth and durability of it with society's support.

Chapter 6

CONCLUSION AND DISCUSSIONS

The main result of the current study is establishing a methodological approach for investigating urban lighting in cities. It has been concluded that lighting is an essential component for further activities to take place in urban spaces at night. However, it is not enough. There has to be an additional function or an event happening under the light to allow people to utilize the urban space. It might be temporary or permanent, as simple as a defined jogging path, or as complex as a set of events organized by authorities. However, there has to be something as light alone does not bear a special meaning anymore as it was a century ago.

Furthermore, recent approaches toward colorful and dynamic lighting on building façades and urban structures give viewers a quite contradictory message, which is becoming a new normal; nothing is happening here! An illuminated building or a bridge does not invite people to join. These illuminated surfaces are becoming a new normal which is meant to be seen from a distance. This visual representation is mainly targeted at users moving within the city in a car or public transport.

It seems that population growth automatically creates and pushes the flow of night-time users into urban spaces, and consequently, nightlife paves its way with or without supervisors and governors. While 24-hour activities seem to be an indispensable aspect of many cities, having 24-hour public urban spaces needs the support of organizations

or governmental bodies to provide safety and infrastructure. Since the current study was conducted based on a specific case, in conclusion, findings focus on and highlight those aspects of lighting and nightlife that affect Mashhad city's livability.

Among all variants, ideology, and in a broader sense, the belief structure seems to play a crucial role in forming the urban night. In Mashhad's case, we reviewed the financial and social aspects of how the light was perceived as secondary elements, which were initially subordinate to the belief structure. However, this status has changed. Mashhad is not just a city of light anymore; it is becoming a city of lights. Excessive exterior lighting of buildings, urban structures, and, more recently, apartments, together with the municipality's encouraging laws to persuade builders to add exterior lighting, have broken the city's semantic relationship to light and light's previous sanctity as a reflection of a spiritual source of well-being and life. From economic and identity points of view, these waves of new lighting can play a significant role in attracting tourists and investments from beyond the city's boundaries while increasing the sense of belonging by empowering the cultural identity of residents. The extension of the concept of 24-hour light to the whole city can be seen as a development of the original identity of the city as the 'city of light.' At the same time, this phenomenon forces the city's transformation into a city of lights more similar to Western examples.

The vital role of governmental bodies and authorities in conducting the wave of nightlife in urban spaces needs to be addressed. Formation of nightlife may occur without the interpretation of authorities. However, when the potential is revealed, it can be accelerated, organized, and managed to bring up the most for the benefit of the city and its dwellers by public authorities. In the case of Mashhad, despite not having a night mayor, the night is integrated into the culture and landscape and the whole city,

especially the Samen district, is kind of semi-automatically manage the nightlife with the help of the tourism section, shop owners, and organization of Astan-e Qods. However, there is also room for further improvements by supports of the city council.

On the other hand, although Tehran, the capital of Iran, has a night mayor, it does not have the same kind of nightlife as Mashhad. Instead, Tehran's night mayor is mainly responsible for supervising activities related to repair and maintenance of streets and urban infrastructure that cannot be performed during high daytime traffic loads, but they can occur at night because of restrictions to urban nightlife. These restrictions in Tehran are mostly related to business hours and security concerns. After waves of protests related to the 2009 presidential election, governmental bodies restricted the open hours of businesses to midnight in order to control continuous gatherings in public spaces. Although there were similar protests in Mashhad simultaneously, night-time usage restrictions never became operational because they were in such contrast to the city's culture. In 2019, the restrictions were still valid, and the battle was carried on between Tehran's municipality and national security agencies. Although Tehran's municipality defined five districts to grant permission for 24-hour activities, as of September 2019, the police of Tehran still rejected providing security after midnight (News.mashhad.ir, 2019; Khabaronline.ir, 2019). Therefore, night-time outdoor activities after midnight are limited to cruising Tehran's urban spaces in private vehicles, which brings up the necessity of investigating the urban nightscape from the point of view of vehicle users.

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For instance, the popular culture of pedestrians shopping and browsing urban spaces at night is now being done from the seats of moving vehicles.

Like traditional ways of transmitting information about being open or serving a special food by using light, exterior light displays on building façades can provide information about ongoing activities inside the building or at nearby public spaces. However, current urban lighting conditions send a mixture of confusing information about the availability of activities or events, especially for cases like banks and similar landmarks that are not open or active during the night but have elite façade lighting. In Mashhad, the passive visual interaction of users at night, or as Virilio (2009) described it, new 'aesthetics of movement' and 'aesthetics of disappearance', has come to a point that is transforming the whole city into an entertaining cinematic experience for vehicle users.

Alcohol consumption and related anti-social behavior have become a critical concern in the Western context's night-time management of public spaces. Robert and Turner (2005) called attention to the depression of desire of any social group, other than youth, to go into city centers at night. Eldridge (2010) pointed out the contrasts between a desirable, safe, and comfortable city center at night and alcohol-related problems such as violence, fear of crime, and public urination. The study by Valentine, Holloway, and Jayne (2010) pointed out the exclusion of Muslim youth from the night-time economies of some city centers due to their culture's abstinence from alcohol. Finally, Liempt, Aalst, and Schwanen (2014) concluded that "Discourses of disorder, anti-social behavior and the 'alcoholization' of urban nightlife constitute a danger for any city that wishes to appear as an innovative, exciting, creative and safe place in which to live, visit, play and consume." In Mashhad, prohibition (at the national level) of

alcohol consumption is considered to be one of the reasons for the increased perception of safety, and consequently, the wide-spread use of pedestrian areas by families. However, the problem is not entirely solved; the alcohol drinking habit has shifted from public areas to private and semi-private spaces, including cars. Thus, drinking alcohol remains a part of the new night-time culture, resulting in unsafe streets and many car accidents. Research on driving behavior in Mashhad confirmed a high rate of alcohol-related accidents (Mousavi Bazzaz, et al. 2015). Drinkers, in most cases, use private cars over public transportation to minimize interaction with people and reduce the risk of being caught by police. As a result, the culture of drinking and finding mates, which usually happens in bars and clubs, has been partially transferred to moving vehicles. This is creating a new way of interacting in public spaces, cruising at night beyond the limitations of Islamic rules.

An alcohol-free zone within the public urban spaces of European countries may help attract a range of users that felt excluded from public spaces during the night due to their beliefs, personal experiences, gender, age, or fear of crime.

It would be really challenging to distinguish between lighting and functions since these aspects act together most of the time. Considering lighting in urban spaces outside the context of other variables of nightlife is like trying to address the public's attitudes without considering their roots and their differences. Lighting plans need to be considered as one variable of the broader context, the 'urban night', where financial, political, and cultural factors play crucial roles in utilizing urban spaces. Public opinion plays a crucial role in the endurance or discontinuity of such projects at the scale of a city. However, by educating the public about urban lighting and attracting participation and cooperation of both the public and local authorities in the process, we can and

should recommend the idea and the knowledge of having a desirable nightscape to the public. Repeated and powerful public announcements regarding the subject of urban lighting can also advance the educational effort. When the topic gains the support of the public opinion, a change in leadership will be much less capable of interrupting the project's rhythm because the people and experts will demand it from authorities in alternate ways. Hence, educating the public and involving a public media expert may help shape a reasonable public image of a lighting master plan project and increase the depth and durability of it with society's support.

A documented systematical approach toward urban lighting provides common ground for further examination and investigation of the night phase of cities. The night-time image of cities, influenced by improvements in lighting technologies, is changing rapidly with or without urban planners and designers. This highly potential source of space, time and income needs proper management and planning to become active and functional and the role of authorities and municipalities in providing infra-structures are inevitably fundamental. However, the implementation of urban lighting in livability measurements in this study is based on the framework provided for comparing livability of European cities. The items that build up the night-time indicators can be used in any context regardless of geographical location. The weighting system needs to be adjusted at the discretion of the researcher according to the context. The current study provides a method toward mapping geographies of the urban night by the systematical representation of activities as nodes on a digital map. The result of this process is a dark map with small bright dots on it, which makes it quite hard to read and understand. However, by setting simple rules and applying Cellular Automata, these small dots start to glow and show their real effect on their surrounding and transformed into what we call 'Night Map' of the city. Cellular

automata have more potentials to be used in urban night studies which are further discussed in the next section.

The connection between the academic organizations is under the pressure of politics, and the primary responsibility of the academic network to expand knowledge is getting affected. Significantly, documentation of cultural traits of East and Middle East regions in English would help move from considering the language as a barrier to a tool that facilitates the flow of knowledge between cultures. For example, in the case of Persian culture, while there are many publications available in English regarding Iranian architecture, less is available about socio-cultural issues that are fundamentals in urban studies.

6.1 Discussion and Further Studies

Urban public spaces are products of cities. Considering the city as a living phenomenon creates misconceptions related to the potentials and requirements of urban open spaces. Like a machine that does not necessarily need to rest the way organic creatures do, if no harm occurs to the environment, urban public spaces do not need to have resting hours. Urban lighting and various functions can boost a sense of belonging and ignite higher usage of urban spaces during night hours. This may create a foundation for forming a 24-hour area depending on the local culture and its happenings, events, and memories that have shaped the place's cultural identity. Organically formed 24-hour urban spaces have already been oriented to their surroundings, both functionally and financially. However, light alone cannot fulfill great expectations of newly formed urban areas. Urban spaces need to also adapt to the extensive use of portable, self-illuminated digital devices and the internet of things

(IoT) to enhance and create new forms of 24-hour areas where distinctions between physical and cyber space and day and night are blurred.

Achieving a comprehensive understanding of 24-hour areas needs precise observations of existing examples around the world. The story of Mashhad may be the story of many similar cities that have collected and developed solutions for using urban spaces during the night. Mashhad is among the lucky cases that have received enough attention to be partially documented in Persian literature. It is one among many interesting stories of local cultures, some of which are not being told beyond their borders.

During the literature review for the current research, a significant gap between academic literature in Western countries and Middle Eastern countries was pointed out. Therefore, this thesis tries to contribute to the documentation of cultural issues in the field of social science for Middle-Eastern countries, which need more elaborated improvement.

Each night-time active area is translated into a node that can be threated by set of defined acts, making it possible to be used in broader applications such as predicting future growth or live prediction of night-time traffic. Also, the application of Cellular Automata can be improved significantly if high-resolution night-time images taken by satellites become publicly available and also by integration of big data, presence of people can be achieved by geo-tags, and a live version of cellular automata can use these data and predict how the crowd may move in urban spaces. This issue might be of great importance in cases of disasters or terrorist attacks on events and similar cases where the flow of people does not necessarily follow ordinary directions.

Up to the time of collecting this research, no study could be found regarding measuring the overall livability of Mashhad in scientific literature. Therefore, the current method can be helpful for future studies on the livability of Mashhad.

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