WALIA journal 31(S4): 113-120, 2015
Available online at www.Waliaj.com
ISSN 1026-3861

The effect of night lighting in urban neighborhoods security and safety

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Abstract: Wanton growth in worldwide crime statistics severely threatens the society in terms of economics, society, culture, and security. This causes serious problems along with urbanization development. Thus, the effect of lighting factors and scales of urban spaces on the security of neighborhoods is investigated in this study. The methodology in this research was analytical-descriptive and data were almost collected by observation and field data collection in urban neighborhoods. In order to rank the security levels, seven scales were investigated: main streets light, the amount of energy consumption for lighting ways, alleys and sidewalks light, light from city signs, parks light, light in front of houses and lighting indicator caused by IL luminance (lux). Then, the coefficient of the effect of each parameter on the neighborhood security was calculated using Entropy Weighting model, and the quality level of each neighborhood and the ideal level were determined using multi-criteria and Analytical Hierarchy Process. The investigation of scales revealed that Main passages lighting had the highest influence coefficients; and the amount of energy consumption for lighting ways had the lowest influence coefficient. The results showed that the districts which had the worst security levels, had the lack of between the district morphology and paths lights infrastructures or use of secondhand utilities and improper position of lighting utilities, among 15 districts witch were investigated in Kerman city.

Key words: *Lighting and illumination indicators; Security; multi-criteria; Analytical hierarchy process; IHWP*

1. Introduction

The population of cities in the world is increasing with average annual growth of 2%. At the beginning of 2000, about half of the world's population has lived in cities, which is expected that the urbanization ratio on the planet rise to 61% in 2030 (United Nation, 2008).This unrestrained growth has engaged residents of cities with numerous problems. Increasing urban crime and insecurity are the results of uncontrolled growth of cities and their unknown identity. Therefore, urban spaces need to be bright at night to maintain safety and security of environment. In this state, the most important issue refers to space lighting and visibility of people and other phenomena. The establishment of safety and security is one of the main objectives of lighting. This study aims to determine the security levels in some areas of Kerman as well as detecting the effect of various parameters of spaces lighting in incidence of crime and specifying the impact coefficient of each parameter on general security within some neighborhoods of Kerman city. According to the in various sources, scores of indicators are specified for each locality with respect to the field perceptions. The entropy weighting method and also the inverse hierarchical multi-criteria analysis method are used for achieving the above objectives. Based on what was discussed, the research hypothesis can be stated that: New established urban localities that are mostly formed in the suburbs and in compulsory development of the city and without paying attention to the suitable design of essential urban infrastructures such as suitable lighting networks of the city have less security.

2. Theoretical bases of the research

2.1. The stress recovery theory

Ulrich believes that the natural landscapes can help to reduce stress while artificial spaces of city not only prevent the stress reduction, but will also lead to the stress (Ulrich, 2002). But, it is important to know that any efforts are done to use natural elements which are visible only during the day. These elements are placed in the dark at night and due to the lack of lighting, they have hallucinatory shape or the excessive use of light and light pollution lead to the lack of the application of these elements. Therefore, in urban places lighting, lighting of natural elements such as plants, urban rivers, etc. should be considered in a way that reinforces a sense of relax in the space. Excessive use of color and light to nightly environmental stimuli in its own turn leads to the psychological stress for individuals (Jeremy et al, 2014). Thus, color should be used consciously and purposefully and with fundamental standards and principles and considering its psychological effects (Amin, 2008).

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2.2. Theory of renewal attention

In this theory, Kaplan about human intellectual fatigue argue that the urban areas because of the need to the direct attention have more mental fatigue than the natural environment and also this theory points to the reduction of complexity and many stimuli in urban landscape (United Nation, 2008). If the natural elements lighting to be done appropriately in urban spaces and with sufficient coherence and legibility, environmental stimuli will be used accurately and appropriately and totally, people will not be forced to apply the excessive attention to understand environment.

2.3. Taking advantage of the psychological effects of light

In the words of the World Health Organization, "Health does not only refer to the lack of illness but also it means the complete physical, social and mental health". The communication network of urban environments and urban spaces' qualities where people engage with them routinely are associated with human health (Amin, 2008).Indulgence and wastage in lighting can have an important role in creating the emotional stress, increasing anxiety as well as the physical problems. On the other hand, a logic and proper lighting can contribute to create a quiet and attractive environment. It seems that by changing lighting in many places and spaces that are used not only the confusion of nightly landscape is reduced but also the health and comfort aspects of human are emphasized and consequently it has positive impact on modern humans' lifestyle(Amin, 2008).

2.4. Theory of the relationship between environmental physical characteristics and security sense

According to the Oscar Newman's theory, spaces with more possibility of visibility which provide a little chance of escape consequently provide less potential for criminal activity. Thus, for example, it is argued that walls and hedges can be considered as physical barriers and increase the insecurity sense while existence of sign that indicates people's supervision on the neighborhood can increase the sense of security(Lotfi and Faraji, 2010).

2.5. The theory of crime prevention through environmental design (CPTED)

This theory is influenced by the thoughts of Jeffrey (1971) and Jacobs (1961). This theory precisely investigates the urban form and fabric and its relation with urban crime. According to the National Institutes of Crime in the United States CPTED is defined "an appropriate design of the built environment that can reduce the fear of crime and improve the life quality" (Iranmanesh, 2005).Miss Jacobs emphasizes on the street more than any other factor in the creation of urban security and says: "If urban streets to be safe from savagery and fear, the city will be safe from the brutality and fear" (Jacobs, 2008).According to Ms. Jacobs factors like bright and crowded locations with careful eyes and big and broad sidewalks in which people's participation is high are effective in shaping the safe urban environment and also suggests variety of users for urban streets (Kalantari, 2001).

3. Previous research

American theorist Jane Jacobs in the 60s decade with a book entitled "The life and death of American cities" is introduced as the first theorist in the field of security. She in one part of his book discuss about issues such as the need for safe spaces in the city, separation and diagnosis of public and private places and variety of users and mixing them together (Jacobs, 2008). In this regard, it can be pointed to the evaluation of the research results of seventy urban design programs about forty cities in the United States which is conducted by Michael South Worth (Southworth, 1989). Also, the study of urban designing qualities with "content analysis" method is conducted by John Punter and Matthew Carmona in seventy-three urban development plans of UK (Carmona et al., 2002). Kapalan have also proposed a theory in 1989 that addresses the issue of human intellectual fatigue in urban environments and artifacts and introduced the legibility of urban environments as one way to alleviate this problem and in order to achieve this strategy, lighting of urban spaces at the nightly landscape has great importance (Kapalan and Kapalan, 1989). Iranmanesh (2005) in an article has investigated the utilization of the crime prevention principles through environmental design in Iran (Iranmanesh, 2005). Amin, in an article entitled "Urban lighting and its role in the design of therapeutic landscapes" concluded that the night landscape can have different effects on the citizens compared to the day landscape. Proper lighting can meet the individual needs and control the place relatively, increase the sense of attendance in the location and increase social interaction (Amin, 2008). Muradi in an article entitled "Security indicators in urban space" has introduced these indicators briefly. However, their effects and importance on the general security are not evaluated. Also, Kalantari in his PhD dissertation has investigated the geographical distribution of crime in Tehran city (Kalantari, 2001). Pakzad and Suri in a book entitled "Handbook of lighting in urban areas" have briefly studied the methods and techniques, and requirements of nighttime lighting (Pakzad and Suri, 2012). Lotfi and Adibi in separate article with an analytical approach have studied and analyzed the security levels in coastal cities of Iran and their effect on tourists' attraction in the tourism areas like Babolsar city (Adibi and Azimi, 2011)(Lotfi and Faraji., 2010).

4. Indices and variables of the research

The lighting design of urban spaces in order to create security can be studied from two functional and physical aspects.

4.1. Physical aspects of urban lighting

Based on the physical view, brightening of the dark and hidden corners, defenseless spaces of the city, lighting of the intersections and active parts of spaces at night, illuminating the interior space of stores to create a feeling of being seen and also making the clear distinction between the public and private sectors are the most important actions to prevent the crime committing and to increase the feeling of security (ChunShing et al., 2014).

In order to study the physical aspects of lighting for providing security four following sub-indices are used:

- Main passages lighting
- Local street lighting and alleys and sidewalks.
- The amount of energy consumption for passages lighting.
- Lighting indicator caused by Illuminance (lux).

4.2. Functional aspects of urban spaces lighting

Also, functional aspect emphasizes on the proper distribution of active and light areas in urban spaces, proper lighting of spaces in order to bring the Internal activity of commercial and recreational units like restaurants, coffee shop into the public areas and behavioral headquarters lighting which can provide this possibility to control urban environment greatly by attendance of individuals in these environment (Marcela Rivera et al, 2014).

In this regard, in order to study the functional aspects of lighting to provide security, the following three sub-indicators are used.

- Lighting induced by urban signs and routing boards, informing and advertising
- Lighting of parks, gardens, waterfront and urban spaces
- Lighting caused by shops, banks and government and public buildings

4.3. Lighting of urban neighborhoods

Every area is located in one city and thereby gets some of its characteristics from it. Lighting in different parts of an area should follow the same rule that governs lighting of whole city. An area as it is considered as a part of a city simultaneously should has its own unique character in order to be distinguished easily all the time for inhabitants and other citizens (Ghasemi, 2004).

4.4. Lighting in the Pathways

Pathways are always predisposing various urban events such as urban transportation, trade, cultural exchanges, conducting religious ceremonies, expressing political votes, and roaming. With these interpretations, pathways should accept all social groups of citizens in different times (Pakzad and Suri, 2012). A large part of the attendance at night requires visual penetration into the realm of the routes. So, the illumination of intersections and the ways that reached to the path should be taken into consideration in nightly lighting (Johansson et al., 2014).

5. Materials and methods

5.1. Methodology

The methodology of this study is descriptive - analytical which is done in some areas of Kerman city with survey and library research method. In this study, according to the conducted studies, light and lighting indicators affecting the environmental security are studied and evaluated. In this regard, the previous seven indicators are reviewed and rated.

Scoring guide is adjusted by authors in

Table 2 and scoring of localities is studied by 20 proficient urban design and electrical engineering experts. Mean of experts' views are collected in Table 3. It should be noted that the indicator of the energy consumption amount for passages lighting by library information extracted from the report of daily magazine of average pressure feeder of localities is calculated in sample days of each season in 2013. After scoring by experts and extraction of the library data, the effect coefficient of each parameter on locality's security is calculated by using entropy weighting model and then the quality levels of each locality and ideal level are determined by using the Inverse Analytical Hierarchy Technique (IHWP). Thus, the input of this method is the numerical values of quality assessment indicators of each parameter in the studied area and localities and its output is tables and charts that are obtained according to the results and the quality desirability of each locality is rated according to the proposed indicators. In information theory, entropy is a measure of uncertainty is expressed by a probability distribution. Measurement uncertainty is expressed as (1).

$$E_j = S(P_1, P_2 \ldots P_n) = -K\sum_{i=1}^{n}(Pi \ln Pi) \qquad (1)$$

$$i = 1,2,3,\ldots n$$

P_{ij} in a decision matrix could be used to evaluate different options. (2) The decision matrix m is Items and n is an index option is considered.

$$\begin{array}{cccccc} & X1 & X_2 & .. & X_n \\ A_1 & r_{11} & r_{12} & \ldots & r_{1n} \\ A_2 & r_{21} & r_{22} & \ldots & r_{2n} \\ \ldots & \ldots & \ldots & \ldots & \ldots \\ A_m & r_{m1} & r_{m2} & \ldots & r_{mn} \end{array} \qquad (2)$$

In this method, at first, weight of each indicator (the amount of the effect on the final quality) is determined by using the entropy model. Initially, the value of n is calculated by using equation (3) for per i and j. In this equation m refers to the number of studied areas:

$$p_{ij} = \frac{r_{ij}}{\sum_{i=1}^{m} r_{ij}}; j = 1,2,...,n; \forall ij \quad (3)$$

The value of Ej

Symbol is obtained with placement of the relevant values in equation (4):

$$E_j = -k\sum_{i=1}^{m}(p_{ij} \ln p_{ij}); \forall j \quad (4)$$

The deviation degree of the generated data for jth variable which is shown with d j is calculated according to equation (5).

$$d_j = 1 - E_j \quad (5)$$

Weights calculation for all j is obtained according to the equation (6) by utilization of the existing indicators.

$$w_j = \frac{d_j}{\sum_{j=1}^{m} d_j} \quad (6)$$

After determining the weight of each indicator or the effect of each indicator on the *wj* final quality, then inverse analytical hierarchy is used to determine the score of each locality from each indicator. Initially, the primary score of each indicator is calculated according to the equation (7) and the score for different classifications of each indicator can be calculated according to the equation (8). Finally, every locality has earned a score from every index that the sum of scores will determine the quality and desirability of the locality.

N = Number of classes for per indicator

J = points obtained for different categories of per indicator

i = number allocated to the various categories of per indicator

$$x = w'j / N \quad (7)$$

$$J = w'_j - (N - i)x \quad (8)$$

6. Recognition and analysis of the studied region

Kerman city is a developing city with a population of 534,441 people that are settled in an area of up to 5224.15814 hectares. Travel of 7814 foreign tourists and 86142 domestic tourists to this city in 2011 demonstrates the high potential of this city in tourist attraction and the creation of sensitivity to provide and improve environmental security (Statistics Centre, based on the latest results in 2011).

6.1. Identification of the areas

This study tried to study the geographical areas which are dispersed on the city level in the form of various localities. In this regard, fifteen districts are studied that constitute about one third of the city's level. Iranmanesh town, Jamaran town, Salsabil, Motahari town, Bahonar town, Emam Jomeh, Pansad Dasghah, Allahabad town, Taherabad town, Alghadir town, Bafte-ghadim, Mahdiyeh, Modiriyat, Malek e ashtar,Goldasht are localities that have been studied (Table 1)(Fig.).

Table 1: Neighborhoods name

Neighborhood	Area code
Iran-manesh	1
Jamaran	2
Salsabil	3
Motahari	4
Shaheed Bahonar	5
Imam-e-Jom-e	6
Pansad-dastghah	7
Allahabad	8
Taherabad	9
Al-ghadir	10
Bafte-ghadim	11
Mahdiye	12
Modiriyat	13
Malek e ashtar	14
Goldasht	15

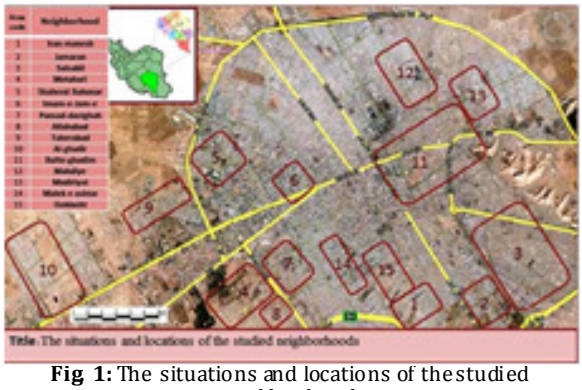

Fig 1: The situations and locations of the studied neighborhoods

7. Findings

Studied indices and also their weighting and valuation method are presented in Table 1. Based on what is proposed in the spectrum from zero to one, the value of one represents the most ideal type of urban design in which the willingness to commit the crime is minimized and the value of zero represents the worst kind of urban design.

7.1. Weighting and investigating the indices studied in the area

With regard to the scores obtained from field and library perceptions for each locality and indicator which is presented in Table 3, the calculation associated with the indicators weighting by using one to four equations are given in

WALIA journal 31(S4): 113-120, 2015
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Table **4**.

From these results it can be concluded that for example, main passages lighting can maximally influence 35% of security of locality and energy consumption can affect 2% of areas' security (Diagram 1).

Now, according to the determined influence of each parameter (weight of indicator) the inverse hierarchical analysis can be completed by (7) and (8) equations for each indicator in the following tables.

According to the

Table **5**, various classes and grades of scores are proposed for each indicator, for example, there are five classes in the main passages lighting in which Class *A* has the highest score and Class *E* has the lowest scores. In these tables *J*-column determines the score of each class.

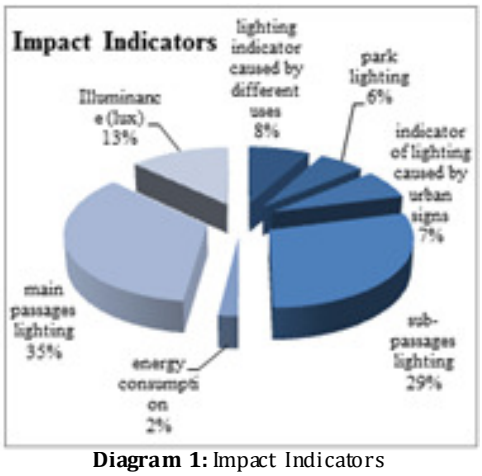

Diagram 1: Impact Indicators

Table 2: Guidelines for indices weighting spectrum

indicators	Weighting spectrum guide	Scores
Main passage Lighting	The existence of light poles orderly and regularly and with appropriate intervals (healthy and sufficient)	1
	The existence of light poles orderly and regularly and with inappropriate intervals (healthy and insufficient)	0.75
	The existence of light poles irregularly and healthy with inappropriate intervals	0.5
	The existence of unhealthy and insufficient light poles with irregular intervals	0.25
	The lack of the existence of appropriate light poles	0
The energy consumption amount for passages lighting	$3_{Kwhr/day/Km2} \leq$ The energy consumption amount for passages lighting$< 2.25_{Kwhr/day/Km2}$	1
	$2.25_{Kwhr/day/Km2} <$ The energy consumption amount for passages lighting$< 1.5_{Kwhr/day/Km2}$	0.66
	$1.5_{Kwhr/day/Km2} \leq$ The energy consumption amount for passages lighting$< 0.75_{Kwhr/day/Km2}$	0.33
	$0.75_{Kwhr/day/Km2} \leq$ The energy consumption amount for passages lighting$< 0_{Kwhr/day/Km2}$	0
Alleys, sidewalks, and local streets lighting	Appropriate and healthy electricity poles with complete benefiting from lighting in the existing apartments	1
	Appropriate and healthy electricity poles with complete benefiting from lighting in the existing apartments	0.75
	Appropriate and healthy electricity poles with inappropriate benefiting from lighting in the existing apartments	0.5
	Inappropriate electricity poles with inappropriate benefiting from lighting in the existing apartments	0.25
	The lack of the existence of the urban light poles and lack of getting benefit from lighting in the existing apartments	0
Lighting induced by urban signs and routing boards	Appropriate utilization of lighting induced by mentioned issues and appropriate legibility	1
	Inappropriate utilization of lighting induced by mentioned issues and average legibility in passages	0.5
	Inappropriate utilization of lighting induced by mentioned issues and very bad legibility.	0
Parks, garden, waterfront and urban spaces lighting Lighting induced by shops, banks and governmental and public building	Adequate and appropriate lighting along with harmony and beauty	1
	Adequate lighting and relative appropriate benefiting from harmonious and beautiful lighting	0.66
	Insufficient lighting and lack of benefiting from lighting	0.33
	Very limited lighting and lack of benefiting from lighting Proper lighting that leads to the identification of locality. (Full legibility)	0 1
	Complete lighting that does not leads to the identification of locality	0.66
	Stunning and sever lighting that does not leads to the identification of Locality.	0.33

	The lack of lighting and full dark spaces	0
lighting indicator caused by IL luminance (lux)	5<lux	1
	4<lux≤5	0.8
	3<lux≤4	0.6
	2<lux≤3	0.4
	1<lux≤2	0.2
	0<lux≤1	0

Table 3: Results of the acquired scores for each locality from each indicator

	main passages lighting	energy consumption	sub-passages lighting	indicator of lighting caused by urban signs	park lighting	lighting indicator caused by different uses	Illuminance (lux)
Iran-manesh	0.213	0.66	0.356	0.189	0.345	0.107	0.4
Jamaran	0.086	0.33	0.081	0.075	0.005	0.029	0.4
Salsabil	0.098	0.33	0.084	0.094	0.047	0.074	0.4
Motahari	0.164	0.33	0.118	0.124	0.349	0.124	0.6
Sh-Bahonar	0.741	1	0.614	0.489	0.684	0.697	0.6
Imam-e-Jom-e	0.792	1	0.764	0.949	0.559	0.894	0.6
Pa-dastghah	0.102	0.33	0.128	0.078	0.101	0.107	0.2
Allahabad	0.027	0.33	0.011	0.005	0.000	0.009	0
Taherabad	0.189	0.66	0.116	0.082	0.078	0.042	0.2
Al-ghadir	0.351	0.66	0.272	0.410	0.212	0.357	0.4
Bafte-ghadim	0.316	1	0.208	0.108	0.032	0.142	0.2
Mahdiye	0.486	0.66	0.354	0.124	0.189	0.143	0.4
Modiriyat	0.378	0.66	0.310	0.146	0.178	0.157	0.4
Malek e ashtar	0.179	0.66	0.126	0.072	0.088	0.052	0.4
Goldasht	0.122	0.33	0.138	0.098	0.131	0.207	0.2
Total score	2.244	8.94	3.68	3.043	2.998	3.141	5.4

Table 4: Results of weighting calculations of entropy model

Relations Entropy	IL luminance (lux)	lighting indicator caused by different uses	Park lighting	Indicator of lighting caused by urban signs	Sub-passages lighting	Energy consumption	Main passages lighting
$k=-\frac{1}{\ln m}$	-0.369	-0.369	-0.369	-0.369	-0.369	-0.369	-0.369
$E_j=-\frac{1}{\ln m}\sum_{i=1}^{m}(n_{ij}\ln n_{ij})$	0.639924	0.804522	0.8316418	0.8208781	0.248107	09484123	0.0809709
$d_j=1-E_j$	0.36007	0.1954	0.1683	0.179121	0.75189	0.515876	0.91902
$w_j=\frac{d_j}{\sum_{j=1}^{n}d_j}$	0.13≅13%	0.8≅8%	0.06≅6%	0.068≅7%	0.286≅29%	0.019≅2%	0.3500≅35%

Table 5: The score obtained from IHWP analysis

Index	Grade (i)	Wj	(x)	(j_n)
Main passages lighting	(5)A	0.35	0.07	0.35
	(4)B			0.28
	(3)C			0.21
	(2)D			0.14
	(1)E			0.07
Energy consumption	(4)A	0.02	0.005	0.02
	(3)B			0.015
	(2)C			0.01
	(1)D			0.005
Sub-passages lighting	(5)A	0.29	0.058	0.29
	(4)B			0.232
	(3)C			0.174
	(2)D			0.116
	(1)E			0.058
Indicator of lighting caused by urban signs	(3)A	0.07	0.0233	0.07
	(2)B			0.0467
	(1)C			0.0233
Park lighting	(4)A	0.06	0.015	0.06
	(3)B			0.045
	(2)C			0.03
	(1)D			0.014
Lighting indicator caused by different uses	(4)A	0.08	0.02	0.08
	(3)B			0.06
	(2)C			0.04
	(1)D			0.02
IL luminance (lux)	(6)A	0.13	0.0216	0.13
	(5)B			0.1084

	(4)C			0.0868
	(3)D			0.0652
	(2)E			0.0436
	(1)F			0.0216

Table **4** and compared with the scoring categories in

Table 6. For example, according to the Table 3, Iranmanesh town has achieved 0.66 score for indicator of energy consumption and nd the value of zero represents the worst kind of urban design.

7.1. Weighting and investigating the indices studied in the area

Table **4**.

From these results it can be concluded that for example, main passages lighting can maximally influence 35% of security of locality and energy consumption can affect 2% of areas' security (Diagram 1).

Now, according to the determined influence of each parameter (weight of indicator) the inverse hierarchical analysis can be completed by (7) and (8) equations for each indicator in the following tables.

According to the

Table **5,** various classes and grades of scores are proposed for each indicator, for example, there are five classes in the main passages lighting in which Class *A* has the highest score and Class *E* has the lowest scores. In these tables *J-column* determines the score of each class.

Table 2 indicates that this score is located in Class B, and based on the

7.2. Weighting and Investigating the Studied Indices in the Area

According to the scores obtained in

Table **5**, grade of scores and total score of each index is calculated for each locality which is shown in

With regard to the scores obtained from field and library perceptions for each locality and indicator which is presented in Table 3, the calculation associated with the indicators weighting by using one to four equations are given in

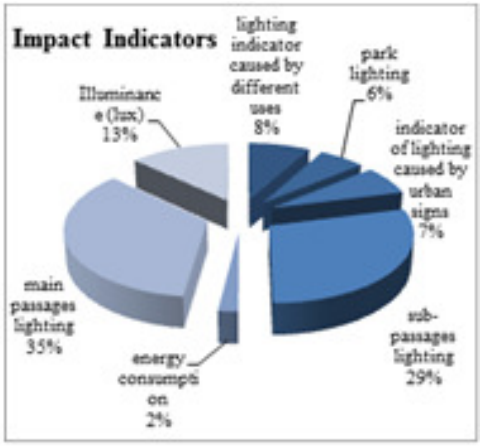

Diagram 1: Impact Indicators

Table **5**, the score of Class B is 0.015. Likewise, each locality of each indicator will get a score that their sum will be the final score of locality (

Table 6).

Table 6: Grade of scores of each indicator for localities total scores

Name of locality	Lighting indicator caused by different uses	Park lighting	Indicator of lighting caused by urban signs	Sub-passages lighting	Energy consumption	Main passages lighting	IL luminance (lux)	Total score
Iran-manesh	D	C	C	D	B	D	D	0.4095
	0.02	0.03	0.0233	0.116	0.015	0.14	0.0652	
Jamaran	D	D	C	E	C	E	D	0.2615
	0.02	0.015	0.0233	0.058	0.01	0.07	0.0652	
Salsabil	D	D	C	E	C	E	D	0.2615
	0.02	0.015	0.0233	0.058	0.01	0.07	0.0652	
Motahari	D	C	C	E	C	E	C	0.2981
	0.02	0.03	0.0233	0.058	0.01	0.07	0.0868	
Sh-Bahonar	B	B	B	B	A	B	C	0.7705
	0.06	0.045	0.0467	0.232	0.02	0.28	0.0868	
Imam-e-Jom-e	A	B	A	B	A	B	C	0.8138
	0.08	0.045	0.07	0.232	0.02	0.28	0.0868	
Pa-dastghah	D	D	C	E	C	D	E	0.1839
	0.02	0.015	0.0233	0.058	0.01	0.14	0.0436	
Allahabad	D	D	C	E	C	E	F	0.1709
	0.02	0.015	0.0233	0.058	0.01	0.07	0.0216	
Taherabad	D	D	C	E	B	E	E	0.2449
	0.02	0.015	0.0233	0.058	0.015	0.07	0.0436	

Al-ghadir	C 0.04	C 0.03	B 0.0467	D 0.116	B 0.015	D 0.14	D 0.0652	0.4529
Bafte-ghadim	D 0.02	D 0.015	C 0.0233	D 0.116	A 0.02	D 0.14	E 0.0436	0.3779
Mahdiye	D 0.02	D 0.015	C 0.0233	D 0.116	B 0.015	C 0.21	D 0.0652	0.4645
Modiriyat	D 0.02	D 0.015	C 0.0233	D 0.116	B 0.015	D 0.14	D 0.0652	0.3945
Malek e ashtar	D 0.02	D 0.015	C 0.0233	E 0.058	B 0.015	D 0.14	D 0.0652	0.3365
Goldasht	C 0.02	D 0.015	C 0.0233	E 0.058	C 0.01	D 0.14	E 0.0436	0.3299

It is seen that if a locality of each indicator get the minimum score, it has a score equal to 0.25 and score 1 indicates the highest score (the ideal locality). Accordingly, the score and quality classification of localities can be divided into six score categories between 1 and 0.25 in the

Table **7**.

Table 7: Spectrum of classification of scores and desirability of localities

Classification of results	0.876-1	0.751-0.875	0.626-0.75	0.501-0.625	0.376-0.5	0.25-0.375
The quality of the safety of localities	Excellent environment	Good environment	Average environment	Poor environment	Unacceptable	Strongly inappropriate
Guidance range color						

Fig.1: Display category scores range and desirability of the location on the map

Table **7**, it can be seen that localities like old tissue area, Allahabad town and Taherabad district, Pansad-dasghah, Jamaran town, Malek-e-ashtar, Goldasht, Motahari, Salsabil, have Strongly inappropriate environments in terms of security and according to environment lighting indicators have

Table **4**, it can be found that the indicators such as main passages lighting as well as the sub-passages lighting have more effects on quality and environmental security improvement of localities and urban spaces and reinforcement of these indicators can contribute to the space security improvement.

8. Conclusion

This study was based on the field studies on the localities of Kerman city and evaluated the relationship between the improvement of the urban environment and localities lighting and the improvement of urban spaces' quality and more security feeling among residents of that area. The result indicated that improving lighting quality of urban spaces and localities can improve the quality of space and quality enhancement leads to the more utilization of space and consequently this issue will lead to the security feeling in urban spaces. In addition, it is recommended that in future studies,

7.3. Analyzing the results of the studied area

With regard to the conducted comparison between

Table 6 and very suitable conditions for crime commitment and based on the studied indicators, two areas of Emam Jomeh and Shahid Bahonar town are respectively the good environments in terms of safety and conditions for preventing the crime incidence(Fig.1).Also, with precise consideration of

the findings of this study to be compared with statistics of crime and delinquency of studied areas and also results of this study can be controlled by other analytical methods like Fuzzy multi-criteria method and or AHP analysis.

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