



## An Examination of Urban Lighting Properties: A Case Study of Antalya City, Turkey

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### Authors' contributions

*This work was carried out in collaboration between both authors. Author CKS designed the study, wrote the protocol, wrote the first draft of the manuscript and managed literature searches. Authors CKS and EK managed the analyses of the study and literature searches. Both authors read and approved the final manuscript.*

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### ABSTRACT

A detailed analysis conducted on selected two main streets from two different district of Antalya city, Turkey to find lightning properties and participant's feelings on these elements. The results were evaluated according to survey obtaining and site observations as well as interviews results with Antalya City Municipal Parks and Gardens Directorate Staffs.

A number of questions were arisen to responders in order to find their feelings (opinions), on properties of lightning elements in the selected areas. It was noted that only 1.0% participant from both area reported as *'the lack of lightning elements is not important for me'*. It was found that participants have expected to proper illumination from lightning elements in these particular areas. However, the lightning elements have found to be some variables and not equally supplied lightning to throughout street landscape object.

Moreover, Republic Street's lightning's looks like better than Sakarya Blouvard lightning in

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regarding participant's responds but with exception of plant and signages lightning. Hence, only plant and signages lightning's were found to be better in Sakarya Blouvard than Republic Street's lightning's. It is important to note that the lightning design principles and lightning element selection conducted by electric technician. So there was no any landscape architectural design principles established in these streets. But, there is an exception that recently established park (in 2012) called 'Martyrs Park' projected by a landscape architecture. Hence, all structures including lightning elements selected and placed by landscape architecture for this park only.

*Keywords: Antalya city; lightning elements; landscape objects; Republic street; Sakarya blouvard; parks; square; signage.*

## 1. INTRODUCTION

The urban design depends both on individual structures and on open spaces, but mostly, the relationship between the two. In turn, the landscape character of a city is reinforced by built form, and the relationship between natural and constructed elements. However, people raise awareness of the living in urban area may make a significant impact in ensuring the continuity of the areas with comfortable value. Moreover, lighting is one of the important elements for urban and landscape design practices. The adequate lighting is a needs of outdoor spaces, use as a natural barrier, secure residential areas, well visual connections between residential, commercial, or public environments and grouping activity functions [1,2]. All these can be appreciated by users.

However, in urban areas, the lightning could be divided to two main groups that are; *functional and architectural lighting*. Moreover, functional lighting is broadly cover on lightning used in traffic or transportation, pedestrian areas, sport fields, shopping centers, industrial areas, billboards, so on. But the priority in this group is to provide a vision to perform a specific job or activity. On the other hand, the architectural lighting is subject to provide lightning on artistic illumination on historical sites, decorating cultural and natural assets including city landscape elements [3-7].

It is one of the important design criteria for urban open spaces to regulated and planned with lighting elements to see environment properly at night time. Hence, some uninteresting objects at the daytime could be more attractive and interested; many objects might become more beautiful and attractive appearance with lighting [7,8]. However, the lighting designers should be known the physics of light production and distribution, and psychology of light perception by people eye, and the response of the materials to

light. But, it is important that the ultimate criterion of success in lighting is the people response. Whether or not is to be seen clearly, easily and without discomfort.

Urban lighting elements are among the first to realize that are elements in the city. So, those elements should integrate and bear the city's identity and can be contribute to its aesthetic performance. Hence urban design has traditionally adopted elements of the urban environment as a many of materials which compose visually structured and unified urban space [7]. However, in a city, there should be a clear lighting '*topography*' that different zones such as; city centers, residential areas, industrial zones, and districts could be required a specific level of lighting. These including combining with aesthetics, functionality and architectural design all together [1,7].

However, light pollution occurs when over-illumination of particular urban areas. This can negative impact on people. However, the light pollution can be avoided if designers minimize light trespass off the site, thus reducing night-time sky glow. Hence, excessively bright lights and frontal lighting should not be used instead lower-wattage lamps should be preferred. Moreover lighting of landscape elements from a long distance can negatively affect night time vision, and should be consider during design practices.

Every places and structures has a different set of variables, and the light levels must be considered for each specific location. In addition lighting levels and an overall lighting plan must be derived from a number of existing conditions, with other desired factors also taken into account. For a landscape architecture, the principles for lighting design to formed illumination on surface with equal distribution of brightness and add aesthetic value to determine the most appropriate solutions. However, one of

the important criteria examined in the process of developing the strategy included the city's image, economy, levels of safety and the potential for spectacle [7,9,10]. Hence, some criterias should be take account for a general lightning design in urban areas [2,7-9]. These are;

- The amount of light required for people activity for which lighting is to be provided,
- The color of light may affect the views of particular objects and the environment,
- Street and sidewalk widths and correlation to each other,
- Path width (in parks or open spaces),
- Typical height and length of buildings (blocks),
- Number, placement, types of landscape elements and plants,
- Roadway geometries and surface properties.

Antalya is located Mediterranean parts of Turkey. It is one of the most reputation touristic and well known city worldwide. It has very high tourism potential due to very rich historical assets, natural richness and suitable climate conditions. This situation reveals the extensive residential occupation, steady emergence of urban event culture and the 24 hour living city. Hence, the role of lighting as an additional tool which extend urban design as place making into the night time is important.

The main framework of the study consists of examining the current lightning status of selected areas to supply information throughout Antalya city's lightning properties. Hence, two main streets from two different districts (one main street from Muratpaşa and Kepez districts) in downtown of Antalya city were selected to examine and evaluate the suitability of the lighting elements and to participant's feelings on current lightning status in those particular areas.

## 2. MATERIALS AND METHODS

The material of this study was Antalya city center where located in Mediterranean parts of Turkey. However, Antalya is very high reputation on international tourism activities which has rich historical heritages and mild climate conditions that makes one of the most popular destinations for tourism in worldwide. Each year more than 10 million tourist and foreigners visited to Antalya and its near environment to see these values. Antalya is a big city category and population is

more than two million with its near vicinity. Administratively, it is subdivided to 19 district and township. So, it is very complicated to study and evaluate throughout city. For that reason, it was believed that most crowded two districts could be represent and give clues on lighting design principles for city. Hence, one main street from each of two different districts was selected for sampling approaches. The selected main streets are; *Republic Street* from Muratpaşa district and *Sakarya Boulevard* from Kepez district. Fig. 1 shows location maps of Antalya city and the selected districts (main streets) with important landscape values. A number of stages have followed to examine and evaluate lighting properties.

- A detailed site observations were carried out,
- The face-to face survey was conducted,
- The photographs were taken and comparative evaluation were made,
- Interviews were conducted with Municipal Park and Gardens Directorate Staff of Antalya city to evaluate from past to current time renovation of lightning elements,
- Some recommendations were made regarding landscape architecture major.

The face-to face survey approached was conducted on randomly selected 100 participants in each district (total of 200 participants) in the period of May 2015 through January 2016. It was believed that those numbers are good enough for this study. A total of 16 questions were directed to participants, with a standard questionnaire procedure. At the end of the survey, participants had spoken freely and give suggestions about the subject area. Each survey was planned to complete in about 10-15 minutes.

The landscape values and lightning elements were examined broadly in eight different places. These are; Parks and recreational units, Sport fields, Squares, Sidewalks, Driveways, Historical monuments and Art objects, Plant and Signage lightning.

## 3. RESULTS AND DISCUSSION

For Republic Street, 42 female and 58 male while for Sakarya Boulevard, 57 female and 43 male, total of 200 individuals (100 from each group) participate to survey. The demographic distribution of responders in each district was

found to be as follows; In Republic Street, the highest proportion of participants were worker (20%) and between 30-39 years old (34%). The similar participant's profile also realized for Sakarya Boulevard that highest proportion of responders were worker (32%) and between 30-39 years old (30%). However, it is noteworthy that 35% of responders in both sites were high school graduate. It was believed that the participants were effective in terms of gender, working status and age distributions for this study.

A number of questions were arisen to participants regarding visit (use) specification of those particular sites. It was found that major proportion of participants (64% for Republic Street and 66% for Sakarya Boulevard) visited in every day basis and most of them for working purposes. It was realized that Republic Street has many commercial centers and touristic shops hence, mostly visited for shopping purposes whereas Sakarya Boulevard has less commercial and touristic values hence, mostly visited for recreational purposes such as; sitting, resting, walking and trekking. It is notable that participants preferred to visit Republic Street with their friends whereas they preferred to visit Sakarya Boulevard with family members. These are very useful information to evaluate landscape objects and lightning elements in selected areas. This result is also consistent as visit purposes of participants to those areas as mentioned above.

After determining general personnel information, further questions were arisen to responders in order to find their feelings (opinions), on properties of lightning elements in those selected areas. Table 1 shows summary of responder's opinions on lightning elements.

First of all, the question of 'Which is important in outdoor lighting elements?' directed to participants. However, almost half of the participants in both streets (49% for Republic Street and 45% for Sakarya Boulevard), respond as 'the area should be illuminated in a sufficient level' while only 1.0% responded as 'the lack of lighting elements is not important for me'. This result could be reasonably considering participants have expected to proper illumination from lightning elements.

In the second question of 'Do you feel safe in this area if no lighting elements placed?' arisen to responders. However, the majority of participants in both district respond as 'yes' (66% and 64%), while lesser extent on 'partially' (31% and 20%) and 'no' (3.0% and 12%), respectively.

In the third question of 'Do you think current lighting elements good enough during evenings?' directed to participants. The 39% of responders from Republic Street and 37% of from Sakarya Boulevard declared to 'enough', while almost equally reported 'not enough' (36% and 34%), respectively.

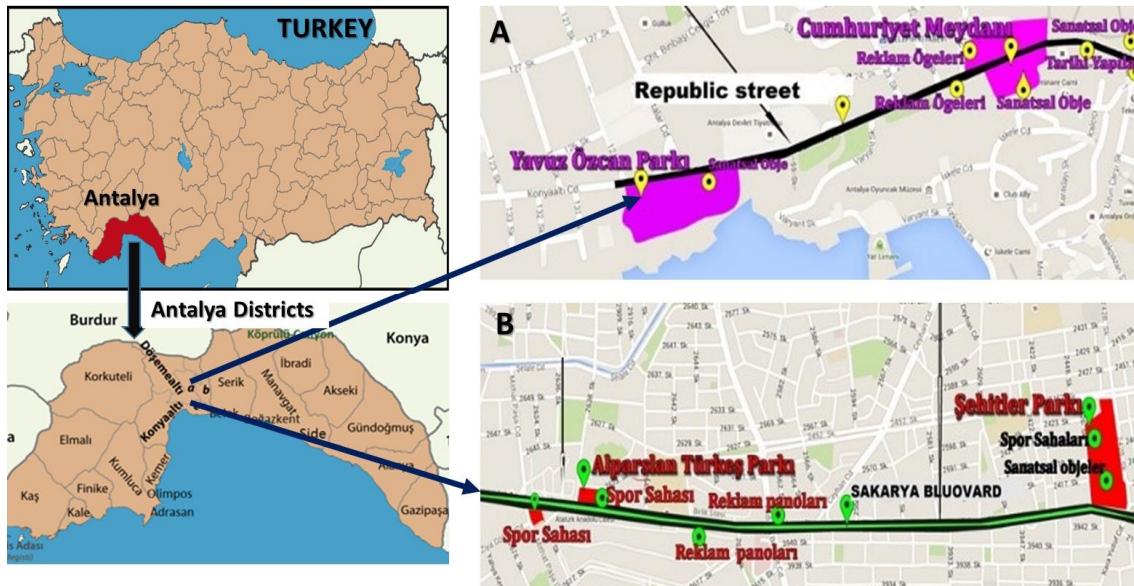


Fig. 1. The study areas in Antalya city (A: Republic Street in Muratpaşa district, B: Sakarya Boulevard in Kepez district)

**Table 1. Participant's opinions on lightning elements and its functionalities**

	Republic Street (%)	Sakarya Boulevard (%)
<b>Which is important in outdoor lighting elements?</b>		
The area should be illuminated in a sufficient level	49	45
Lightning should be ensured in functional way	26	35
Lightning should be ensured in aesthetic way	24	19
The lack of lighting elements is not important for me	1.0	1.0
<b>Do you feel safe in this area if no lighting elements placed?</b>		
Yes	66	64
Partially	31	20
No	3.0	12
<b>Do you think current lighting elements good enough during evenings?</b>		
Enough	39	37
Not enough	36	34
Partially	25	24
<b>Do you think the lighting elements have sufficient aesthetic appearance?</b>		
Insufficient	41	37
Partially	35	34
Sufficient	17	26
No idea	7.0	3.0
<b>Do you think the lighting elements reflecting the city's identity?</b>		
Incompatible	50	30
Partially	28	29
Compatible	9.0	25
No idea	13	16
<b>Do you think renovation and maintenance of the lighting elements are enough?</b>		
Being done and enough	34	38
Being done but not enough	23	24
Not done	21	23
No idea	22	15

In the fourth question of '*Do you think the lighting elements have sufficient aesthetic appearance?*' arisen to participants. Only 17% of participants from Republic Street and 26% of from Sakarya Boulevard respond as '*sufficient*'. This is very important findings on lightning elements which majority of participants have feelings that those elements have not bear sufficient aesthetic appearance. This result was expected because it was found that most of the lightning poles look like galvanized old style in both street rather than modern looking poles.

In the fifth question of '*Do you think the lighting elements reflecting the city's identity?*' directed to participants. It is noteworthy that almost half of participants in Republic Street respond '*incompatible*' while lesser extent (30%) respond '*incompatible*' in Sakarya Boulevard users.

In the sixth and final question of '*Do you think renovation and maintenance of the lighting elements are enough?*' directed to responders. However, 34% of participant from Republic

Street and 37% of from Sakarya Boulevard were responding to '*being done and enough*'.

However, in order to determine design principles and renovations works from past to current time, some interviews conducted with Antalya City Municipal Parks and Gardens Directorate Staffs. Information found from those clearly indicated that all lightning elements throughout Antalya city were selected and established according to general lightning procedure. They had also declared that all the lightning elements have periodically controlled for maintenance and renovation works conducted by them.

It was found that Republic Street's lightning elements (in Muratpaşa district) were renovated at 5 years ago. Since then, there have no any major maintenance and renovation works carried out. Moreover, staff declared that, these element's design principles conducted by electrical engineers and their periodical controls and fixation have also carried out by electrical technicians. So there are no any landscape

architectural design principles or works conducted even not any landscape architecture enrolled during establishment of these elements.

The similar results were found for Sakarya Boulevard (in Kepez district). However, there have no any major maintenance and renovation work carried out in this street since 10 years. Similarly, all design principles and lightning element selection conducted by electrical engineers in this area. So there was no any landscape architectural design principles established in this street as well. But, there is an exception that recently established park (in 2012) called '*Martyrs Park*' projected by a landscape architecture. Hence, all structures including lightning elements selected and placed by landscape architecture for this park only.

After the determination general information's on selected streets and status from past to current times, further research conducted to find participants feelings and expectations from lightning elements. For that reason, the lightning elements were subdivided to eight different conditions to evaluate according to their landscape design principles and functions. In this regards, those were evaluated for their functions, impacts on participants and feelings/demands of responders from that elements, etc.

### 3.1 Parks and Recreational Fields Lightning's

There is a big park named '*Yavuz Özcan park*' located on the Republic Street in Muratpaşa district. This park is also second largest public open space (22.000 m<sup>2</sup>) after Republic Square in Antalya city. The location of park is very unique on cliffs that direct openings to marina and coastline. Hence, it is very easy to reach some touristic shops, commercial places and historic city center (old town) from park. This park has already undergone many renovation and maintenance works since it was founded. Its current status established in 2015. There is one sculpture, three ponds and one amphitheater located with free roaming, seeing and terraces in park. Hence, the functions of lightning elements have considered being very important issue for this park. For that reason, the lightning elements carefully observed and evaluated in a general sense with certain lightning criteria's. As seen in Fig. 2, the park is well organized regarding landscape design principles. However, a numerous of the lightning elements located around park and many of these elements looks

like sufficient illumination with aesthetic appearance.

On Sakarya Boulevard, the '*martyrs park*' located in Yenigün neighborhood. This park was constructed a memory of 'Çanakkale naval victory', at 97<sup>th</sup> anniversary held in 2012. However, there are some monuments, themes and structures located for representing various periods such as; 'memories of Sarikamiş epic', 'national struggles', 'world war I', and some wall reliefs established (Fig. 3). The park is covered approx. 31.320 m<sup>2</sup> area and looks like well organized.

Another park in on Sakarya Boulevard was built for memory for '*Alparslan Türkeş*' who was deputy prime minister in past. This park was originally built in 2001 and major renovation conducted in 2010. However, one playground, one fitness area, living units, pergolas and gazebos were located where covered approx. 3.091m<sup>2</sup> area.

These three parks have very unique location and extensive number of visitors all day. Hence they should be safe not in day time but also at night time as well. The lightning should be provided to needs with the demand for security and user satisfaction. For that reason, to ensure continuity and evaluation of user needs should be considered. Therefore, the survey data collected in this places, evaluation and examination of lightning elements given in Fig. 4.

It was realized that high proportion of participants from both streets have reported '*moderate*' lightning in Republic Street (43%) and Sakarya Boulevard (39%) while only 2.0% of participants from Republic Street and 8.0% of from Sakarya Boulevard respond as '*extremely insufficient*' lightning. This result clearly indicated that Yavuz Özcan Park's lightning properties looks like better than *Martyrs and Alparslan Türkeş parks* in regarding participant's responds.

However, for security purposes after work hours (at night times) there is often a tendency to over-light parks, Hence a well design plan should relate the functions of parks in the evenings. The result found in this study indicates that the lightning properties of parks could be classified as '*medium level*' lightning. It is important to note that the intensity and color of the light important elements to be illuminated. Moreover, for parks in both streets, mostly the high-pressure sodium (HPS) lamps utilized effects a yellowish-orange



glow that distorts colors, diminishes visual clarity and undermines the quality of the night-time environment. In contrast, metal halide lamps, produces a soft, white glow that renders color accurately, provides better visual clarity, and requires less wattage for the same level of

visibility [7]. Furthermore, LED fixtures provide the same beneficial luminosity characteristics and qualities as metal halide but are far more cost efficient and should therefore be considered. Hence, the lamp selection should be carefully made for these areas.

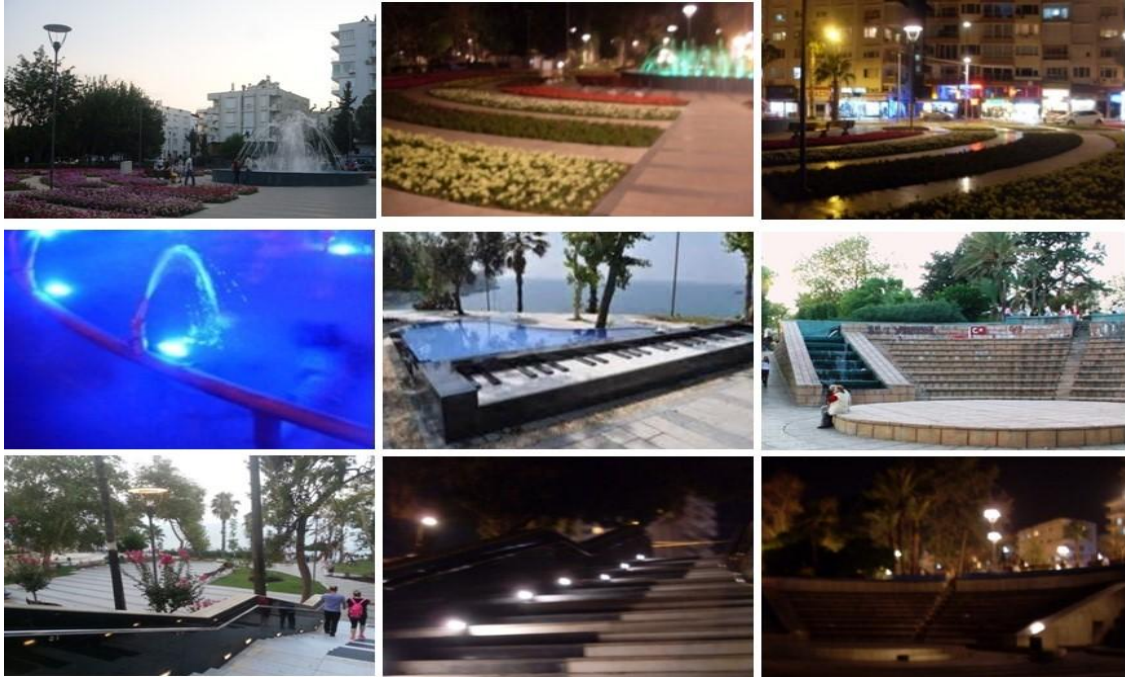


Fig. 2. Yavuz Özcan park on Republic Street

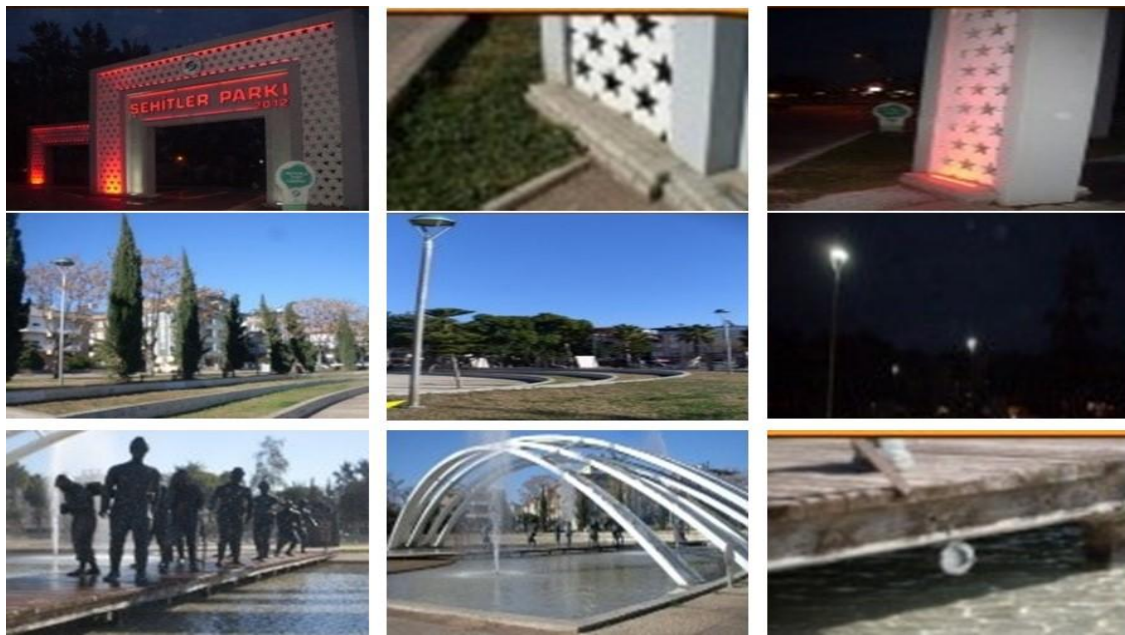


Fig. 3. Martyrs park on Sakarya Bluouvard

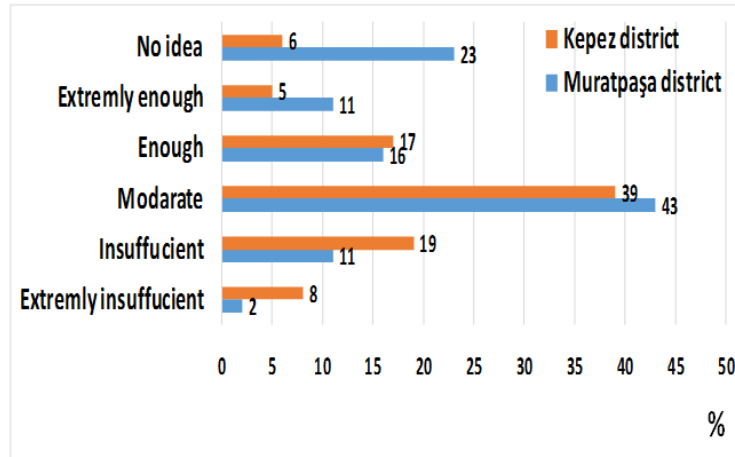


Fig. 4. Participant's opinions on parks and recreational field lightning

### 3.2 Sport Fields Lightning's

It is important to provide proper lightning's to these fields especially at dark time for proper use and benefits in all day. For determining visitors' opinions on the lightning elements in sport fields, survey conducted for only Sakarya Bluovard in Kepez district (there is no sport fields on Republic Street).

In Martyrs park, well-organized sport fields and lightning elements were observed. This field has found to be illuminated with a number of lightning poles at 8.0 m. height, with provided triple lamps. There is also a fitness facilities placed in Alparslan Türkeş Park. But, there have not any design principles even not any lightning elements and lightened procedure established for that particular area in the park. Furthermore, although some sport facilities in Zafer neighborhood on Sakarya Boulevard, there was no any lightning elements can be found for that places. So these fields are out of usage during night times. Although primary purpose of lightning is to provide safety and security at dark times, a well-designed lighting in sport fields can add color and vibrancies at night and improve aesthetical appearance of these places. Hence, the lightning design procedure should be considered for those places. The location of light poles should be coordinated with other street elements, and utility equipment both above and below ground, should be well designed.

### 3.3 Square Lightning's

Although the Republic Square looks like center of city and historically great importance, this square

and its near vicinity located on cliffs and have clear seen on Kaleiçi site (old town) from top of the houses. This square is also one of the most important places in terms of tourism activity. So the domestic and foreign tourists intensively use and travel around of the square. Hence, especially at dark times, it is important to ensure sufficient lightning elements and readability of signages. For determining visitor's opinions on the lightning elements in Republic Square, the survey conducted only for Republic Street (there is no proper square in Sakarya Bluovard). Fig. 5 shows the general appearance of Republic Square and its near vicinity during day and night times.

It was realized that there was sufficient lightning poles and elements for this square. However, none of participants have reported as '*extremely insufficient*' or '*insufficient*' whereas majority of participants (76%) declared that the lightning of the square was '*sufficient*' level.

It is well known that a particular place lighting, first, it should be considered in terms of what types of lights used, with their placements and intensity. The result found for Republic Square lightning clearly meet the user demand. Hence, it is reasonable to propose that the lightning elements have supplied good enough lightning to Republic Square for ensuring safety and visibility of signages at night times.

### 3.4 Sidewalks Lightning's

Although lightning is primarily planned for night time visibility for security and safety, sufficient street lighting takes into account for users of the



street. However, street illumination enhances the safety of traffic and pedestrians crossing; it is used to provide warnings about hazards, and helps increase security and reduces vandalism. Hence, it is more than just a technical requirement, a security need, or a design element.

A question was directed to participants for feelings on lightning elements and responds were summarized in Table 2. However, very high proportion of participants (36%) was reported 'extremely sufficient' lightning in Republic Street's sidewalks while only 11% of participants found to be 'extremely sufficient' lightning for Sakarya Blouvard's sidewalks. Moreover, only 4.0% of from republic street and 2.0% of from Sakarya Blouvard respond as lightning was 'extremely insufficient'. This finding is important that Republic Street's lightings looks like better than Sakarya Blouvard lightning properties in regarding participants responds.

**Table 2. Participants' opinions on lightning elements for sidewalk lightning's**

	<b>Muratpaşa district (%)</b>	<b>Kepez district (%)</b>
Extremely insufficient	4.0	12
Insufficient	6.0	19
Medium	20	37
Enough	34	20
Extremely sufficient	36	11
No idea	-	-

Footcandle is one of the most common units of measure used by lighting professionals to calculate light levels in spaces. A footcandle is defined as the illuminance on one square foot surface from a uniform source of light. However, the Illuminating Engineering Society (IES) recommends some footcandle levels to ensure adequate illumination and safety for occupants [11]. The Canadian Standards Association has already established an illumination standard for pedestrian sidewalks that 0.4 footcandles are a level that a person's face can be identified from a distance of 12-15 metres [7,12]. Moreover, sidewalks require intensities from less than one-half footcandle for walkways to five footcandles for building entrances, and intersections. Hence, if the heights of luminaires are reduced, more fixtures may be needed, which means the luminaires and poles and their placement can have a more positive effect on the streetscape [7,13-15]. It was observed that there was not

standard procedure applied to placement of light poles in both streets.

### 3.5 Driveway Lightning's

The driveways are usually utilized in all day period with motorized vehicles. So it has very important transportation functions for cities. However, in order to determine lightning properties of these streets, a careful observation made on the site. For determining visitors opinions on the lightning elements in driveways, the survey conducted for study area. Fig. 6 show the respond of participants on driveway lightning. Similar findings have also realized for driveways lightning's that high proportion of participants (39%) have reported 'extremely sufficient' lightning for Republic Street driveway while 18% of found to be 'extremely sufficient' lightning for Sakarya Blouvard driveway. However, only 2.0% of visitors from Republic Street and 4.0% of from Sakarya Blouvard responds as 'extremely insufficient' lightning. This finding is important to note that Republic Street's driveway lightings looks like better than Sakarya Blouvard driveway's in regarding participants respond. In Republic Street, it was realized that the height of the lightning poles approx. 9.0 m and at 5.0 m level, there have also traffic lights placed for pedestrians and vehicles. However, some consideration should take account for driveways that the arc of light created by a source varies with its height from the ground. Hence, the wide streets (i.e. Republic Street or Sakarya Blouvard) may also require that the light source be extended further over the roadbed.

### 3.6 Historical Structures and Art Objects' Lightning's

The highlights of historical objects for a particular area and well-lit historic details draw attention to the uniqueness. Lighted sculpture, fountains, bridges, towers, and other major elements in a street, especially those visible to passing pedestrians and vehicles, provide a form of way finding. However, the historical structures and art objects are important monuments for city identity. It was realized that a number of that objects have located in both selected areas.

In Fig. 7, a number of historical structures have been examined and carefully evaluated for lightning properties. The sculpture of Seljuk Sultan Gıyaseddin Keyhüsrev was conquers of Antalya and thanks to him; it became an important commercial city since then (in 1200s).

There are also some castle parts and residues in that area belong to Hellenistic period. This castle built for protection of Antalya city at past time (old town). These structures are very important for representing historical reputation of Antalya and should be proper lightning provided. However, it was realized that the similar lightning techniques was utilized for clock tower and castle. There is also one of the most important historical sculptures on city square that called '*National Rise Monument*' built in 1964. It has symbolized to independence war and rise to Turkish Republic. Another important sculpture was located on Republic Street that called II. Attalos sculpture. He was a Pergamon king and lived in period of 220 to 138 BC. He was also first founder of Antalya city and hence important personality for Antalya's history.

In Martyrs Park, some theme works have already placed throughout park. Those represent some

heroism, patriotism, martyrdom, independence war, and establishments of Republic periods. However, although these themes very important and represents very unique events, there was no proper lightning's observed to see and visibility during dark times. Even, it was realized that there was no any serious works conducted for lightning for these structures.

Fig. 8 shows the respond of participants on historical structures and art objects lightning. However, the majority of participants respond that the lightning on historical structures and art objects are '*extremely enough*' (51%) for Republic Street while only 4.0% of were found to be '*extremely enough*' for Sakarya Bluovard's objects. This finding is clearly indicated that Republic Street's lightning looks like better than Sakarya Blouvard lightning regarding historical structures and art objects' lightning properties.



Fig. 5. General view of Republic Square at day and night times

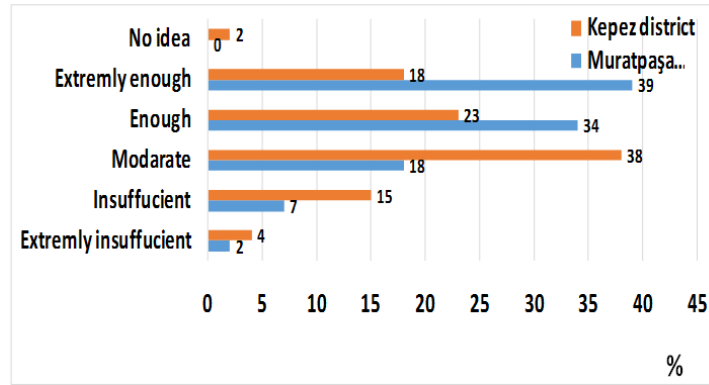


Fig. 6. Participant's opinions on driveway's lightning



Fig. 7. Some important historical structures on Republic Street

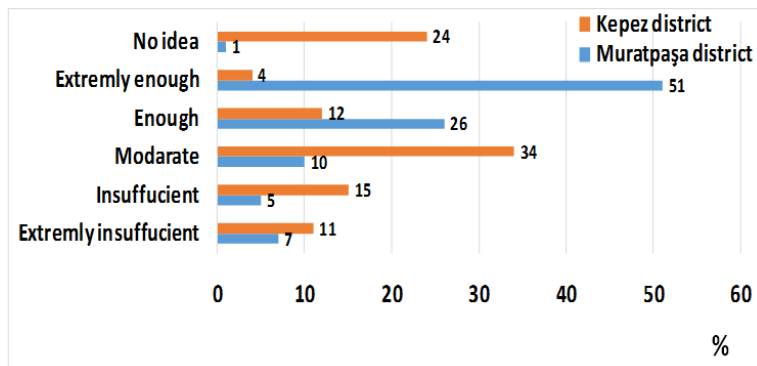


Fig. 8. Participant's opinions on historical places and art objects

### 3.7 Plant Lightning's

It was observed that a various forms of plant materials have utilized in both streets. However, participants respond regarding plant lightning's for both area summarized in Table 3. It was realized that very high proportion of participants (34%) has reported 'extremely insufficient' plant lightning for Republic Street while only 8.0% of declared to be 'extremely insufficient' lightning for Sakarya Blouvard. Moreover, only 3.0% of participants from Republic street and 2.0% of from Sakarya Blouvard respond as 'extremely sufficient' lightning. This findings is important that Republic street's plant lightning's looks like worse than Sakarya Blouvard. This is a clear contrast to other lightning findings for Republic Street's that all of the lightning properties found to be better than Sakarya Blouvard.

However, the suitable distance between a plant and a light source should be provided proper plant lightning. Moreover, if the light from a fixture is blocked, alternative lightning design should be considered to be used for achieving need level of illumination. In our study, it was observed that there is not standard plant lightning establishment or standard procedure followed for lightning on plants for both streets.

**Table 3. Participants' opinions on lightning elements**

	Muratpaşa district (%)	Kepez district (%)
Extremely insufficient	34	8.0
Insufficient	45	14
Medium	13	39
Enough	3.0	14
Extremely enough	2.0	3.0
No idea	3.0	22

### 3.8 Signage Lightning's

A well lighted signages along with directional and informational maps, are essential to providing orientation at night. It was found a various forms of signages that utilized in both areas. It was realized that lightning of signage's on Republic Street looks like below human eye level. The similar signages had also realized in Sakarya Blouvard. It is noteworthy that on both streets' lightened signages looks like functioned as expected and at suitable conditions.

The survey results for signages shown in Table 4. It was realized that majority of the participants (54%) have reported 'insufficient' signage lightning in Republic Street while only 6.0% of respond to be 'extremely insufficient' lightning for Sakarya Blouvard. However, 10% of from Sakarya Blouvard and only 2.0% of from Republic Street respond as 'extremely sufficient' lightning. This finding is important that Republic Street's signage lightning's looks like worse than Sakarya Blouvard signage lightning properties in regarding participant's responds. This is also a clear correlation with plant lightning results for Sakarya Blouvard that all of the lightning properties worse than Republic Street's except plant and signages lightning.

**Table 4. Participants' opinions on lightning elements for signages**

	Muratpaşa district (%)	Kepez district (%)
Extremely insufficient	33	6.0
Insufficient	54	7.0
Medium	8.0	43
Enough	2.0	21
Extremely enough	2.0	10
No idea	1.0	13

### 4. CONCLUSION

Republic Street and Sakarya Blouvard are major streets and should have visual precedence over minor streets and lanes. Hence, these streets' landscape design should be formal and regular in their placement and proportional to the width of the street and height of the building facades. However, when people are concerned about security, there is a tendency to over-light a park, street, or other public space. But in fact, too much lighting can be just as rude as too little lighting. Moreover, well planned evening lighting around structures contributes to the safety of a street. Lightning can also help people to reach focal points (bus stops, fountains, buildings, bridges, towers, sculpture, and et al.) as landmarks to help them find their way. It was realized that the lightning properties looks like better in Republic Street rather than Sakarya Blouvard.

The architectural or historical character of the building or park edge, the existence and density of plants, and the degree of ambient light of these characteristics can strongly impact the effectiveness and appropriateness of various

light fixtures and must be included in the analysis of lighting concepts. However, the traditional architectural character has too much street silhouettes issued in both Republic Street and Sakarya Bluovard areas. So the height of new buildings form determines silhouettes of Antalya city.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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