Analysis of Orientation of Bedroom Masses in Accommodation Buildings in Istanbul - from the Sustainable Tourism Point of View

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***Abstract*—İstanbul is the second largest and important tourism destination after Antalya in Turkey. 12,414,677 tourists visited İstanbul, whose total bed amount was 143,782 in 2015. The decisions that are composing the orientation of accommodation buildings affect the profitability of the facilities, use of sustainability of the resources and sustainable tourism (orientation to view and energy saving). The purpose of this study is to scrutinize the decisions, which have been made for the orientation of the bed masses, and to analyze these decisions by way of twenty sample hotels and to tabulate this analysis. Methods and materials; Maps showing all hotels in İstanbul have been obtained. Number of hotels in each province of İstanbul has been obtained. The results indicate that the hotels are concentrated in the culture triangle [24] and the historical peninsula.**

- **Twenty sample hotels have been selected considering the location, type, orientation and relation with view criteria.**
- **Particular wind maps for the selected hotels have been used for identification of dominant wind, speed of wind for each season and direction thereof, which affects the bedroom masses.**
- **Orientation decisions have been reviewed under climatic, environmental and regulative titles and the result been tabulated.**

In this study, twenty hotels' bed mass orientation decisions have been analyzed in respect of decreasing the heating-cooling loads by way of orientation. Orientation of building façade, windward in summer and sunward in winter, is very important for the profitability of a facility and sustainability of the resources.

Bed mass orientation decisions have been classified under three main titles, which are climatic (heating-cooling loads, sun light, wind) environmental (street access, activity zone, view restriction, pricing policies, location of shading elements) and regulative titles and tabulated accordingly. Bed mass orientations of twenty sample hotels, in the table, have been examined in detail as per the aforementioned design-related decisions.

***Index Terms*—Sustainable tourism, hotels, wind, sun, view, elevation, İstanbul, accommodation building, energy saving, hotel room, orientation**

I. Introduction

The accommodation buildings and the tourism sector have an essential place in Istanbul in economic sense (12 414 677 tourists visited Istanbul in 2015 [1] and the total bed capacity is 143.782 at the tourism establishment certificated hotels [2] and 42.668 at the municipality certificated hotels. [3]). The decisions constituting the bed masses of the accommodation buildings affect the profitability of the establishment from economic point of view and the sustainable use of the resources (orientation to the view and energy saving). These are;

-The price of the bedroom which orients to the view is high. (view room price difference 10%[1]) (Fig. 1),

-The highness of the rate of being exposed to dominant winds for the facades of the mass in summer and the increase of the sunny facade rate of the mass in winter result in positively with regard to the energy saving.

The orientation to the view constitutes high priority in terms of the salability of the bedrooms in the design of the hotel bed masses in Istanbul both historical and natural view value of which is very high. However, it is one of the essential priorities of our present day to use the renewable energy resources, wind and sun in the mass design for the energy saving. (LEED certificate, BREAM certificate and Regulation on Energy Performance of Buildings) The orientation to the view and the smart orientation in order to mitigate the heating-cooling loads are among the issues which are required to be importantly managed from the zoning status decisions to the mass decisions.

[1] This rate has been obtained by analysis of the pricing of the view-oriented and non-view oriented rooms in Pendik Greenpark Otel, Cankurtaran Armada Hotel, Çırağan Kempinski Palace, Bosphorus Palace Hotel, Sultanahmet Four Seasons Hotel, Les Ottomans Hotel ve Ataköy Sheraton Hotel.

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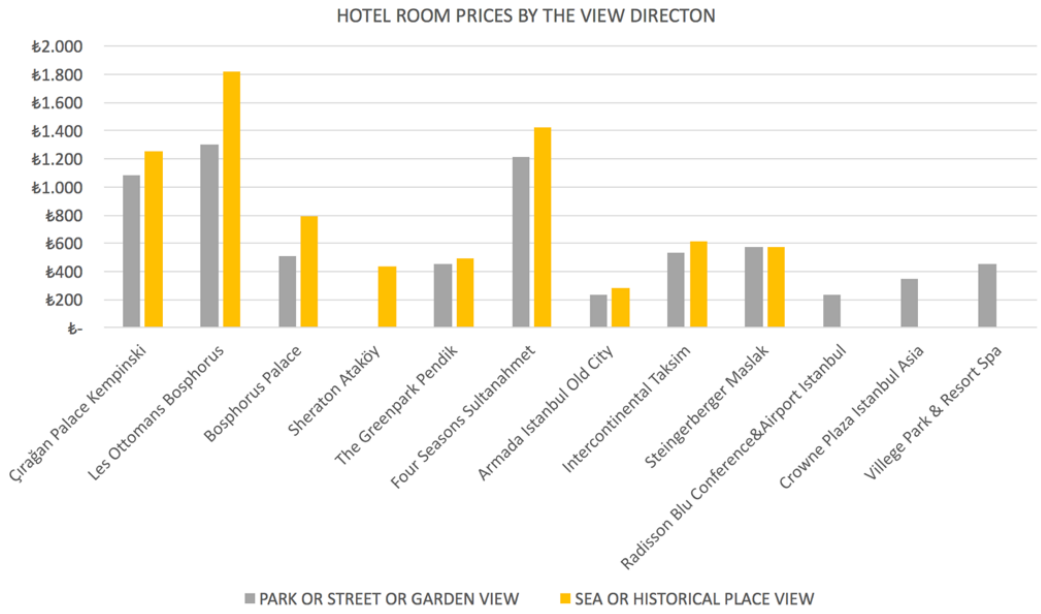


Figure 1. Hotel Room Prices by the View Direction-Elif Büyükekiz Şimşek

In Turkey, there are generally the criteria of "the Regulation on Energy Performance of Buildings (BEP)" for the energy performances of the buildings and the criteria of "Green Star Certificate" given by the Ministry of Culture and Tourism of the Republic of Turkey for the accommodation buildings.

However, these criteria do not scrutinize the mass-orientation-view-function relation of the accommodation buildings.

II. Purpose

In the research, the orientation analysis was made through the data grouped under the titles of climatic, environmental and regulations in the bed masses of 20 hotels selected in Istanbul. The results of the analysis were evaluated in terms of the renewable energy usage indicators.

In order to achieve this purpose, the following sub-goals were realized:

1-The maps were obtained. (Maps which were obtained from Başarsoft company and which indicate the locations of the accommodation buildings in Istanbul as point and point wind maps obtained from the General Directorate of Renewable Energy of the Republic of Turkey)

2-The selection criterion of 20 sample hotels was realized.

3-The view-room price determination study was performed.

4-The area assessment study was performed. (On-site assessment of the hotel bed masses and the environmental factors)

- Mass-width-length
- Orientation-view
- Tree
- Building
- Shading elements (Horizontal-vertical shading elements, balconies)
- transportation, shopping, pharmacy, hospital building, bank, religious building, recreation)

The assessments of the bed masses of 20 hotels selected from Istanbul (5, 4, 3-star and municipality certificate hotels) were made under the following titles in accordance with the criteria determined in the literature [4], [5].

The assessment study was made according to their status in terms of

-Heating-cooling load, wind (climatic factors),

-Activity areas, view restrictions, location of shading elements (environmental factors) and

-Regulations.

III. Literature Summary

The literature section is composed of two main sections. Firstly; the data defining the orientation analyses was generated through the literature. Secondly; the limits within which the assessment will be made in terms of the renewable energy usage in the bed masses of the accommodation buildings were determined through the literature.

BSNL Architecture [5] stated that the orientation criteria in the buildings are heating-cooling load, sunlight, activity zones, local urban design statutes, wind, urban regulations, view restrictions and urban design regulations. Level (The Authority on Sustainable Building) [4], however, determined these criteria as sun, access to the view, cooling winds, relationship with street, location of shading elements, vehicle access and park. As a result of the analysis of the criteria in both sources, the orientation principles that we will use for the article were divided into three separate sections, namely climatic factors, environmental factors and regulations. These section were also categorized among themselves, namely

heating-cooling load and wind as the climatic factors; activity zones, view restrictions and location of shading elements as the environmental factors and the regulations.

"According to G. Bardet; J. Lebreton; Vinaccia; Hilbenseimer; Victor and Aladar Olgyay brothers, the studies carried out in relation to the effect of the orientation on the heating-cooling load which is one of these criteria are included in the literature as the ideal orientation theories. In the ideal orientation criteria, whereas the orientation to south is accepted as the best, the deviations to southeast and southwest at specific rates are also acceptable." [6], [7], [8] "The direction is an important factor in taking advantage of the heating effect of the solar radiation and the cooling effect of the wind." [9] (Table I)

In the literature studies, with regard to the wind: 'The primary purpose in the orientation of the building is to increase the energy efficiency through the optimization of the climate effects in ensuring the comfort conditions. For this reason, cyclically;

• "it is necessary to take advantage of the cooling effect of the wind while being protected from the heating effect (shading) of the solar radiation (summer: period during which heating is not desired)", [10], [11]

TABLE I. BUILDING ORIENTATION [12], [13]

Climatic zone	Building Orientation				
	Optimum solar orientation	Good orientation ranges	Valid orientation ranges	Settlement direction by the Sun	Wind protection/ utilization
Cold	Wide surface 22° southeast from south	20° southwest and 45° southeast	31° southwest and 86° southeast	East-west axis	Closed to wind, on northeast-southwest axis
Temperate-moist	Wide surface 10° southeast from south	13° southwest and 35° southeast	23° southwest and 49° southeast	East-west axis	Giving wide surface to wind
Temperate-arid	Wide surface 27° southeast from south	10° southwest and 56° southeast	14° southwest and 83° southeast	East-west axis	Not giving wide clearance to wind
Hot-moist	Wide surface 3° southeast or north direction from south	10° southwest and 19° southeast	19° southwest and 30° southeast	East-west axis	Open to wind, Elevated from the ground
Hot-arid	Wide surface 18° southeast from south	0° south and 40° southeast	8° southwest and 50° southeast	Southwest-northeast axis	Clearances are in the direction of yard; the yard is in the northern direction

• "to be protected from the cooling effect of the wind (windbreaker) while taking advantage of the heating effect of the solar radiation in the least hot period (winter: period during which heating is desired)." [9], [14] "The building plan developing in line with the east-west axis is the optimum design that can take advantage of the sun light. The plans which are designed in line with north-south axis, however, extremely gain heat in the hot seasons and do not take advantage of the solar heat in the winter season (Table I)." [12], [13]. "The most important facade which is required to be designed towards to the sun light, however, is the southern facade (the northern facade in the northern hemisphere) and then the eastern facade. The shading design in the building clearances is an essential parameter for the purpose of gaining heat and preventing glare in the eastern and western facades. In this way, the building orientation provides the opportunity to take advantage of natural light in indoor and also is considered as a hazardous criterion in terms of shading and re-emitting of the radiations." [15]

"If it is desired to take advantage of the cooling effect of the dominant wind, it is necessary to reduce the heat energy amount to be stored in the building in the hottest period. At this point, an orientation in the northern direction will reduce the cooling loads and ensure the energy conservation hot-moist climate zones with cooling priority. The physical environmental conditions changing according to the orientation should be tried to be optimized with the space organization, the building shell formation and the material selection depending on the climatic comfort requirements." [9]

The buildings should be at the walking distance to public transportation, market, pharmacy, bank, religious and education buildings, medical and social facilities, recreation areas and public parks. [16]

The optimum use of the shading elements:

- Trees (deciduous high-trunk trees in south) [17]
- Horizontal shading elements (horizontal shading element in the south) (Fig. 2) [17]
- Vertical shading elements (vertical shading elements in the west and the east) (Fig. 3) [17]
- Nearby buildings
- Balconies

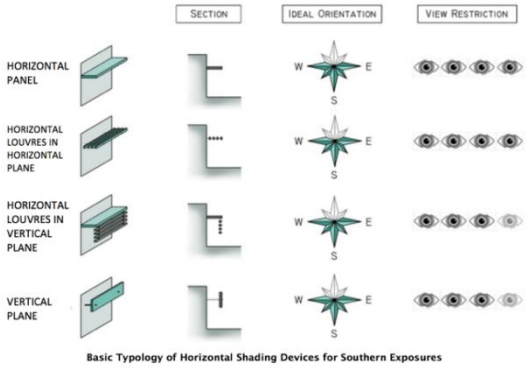


Figure 2. Horizontal shading elements [17]

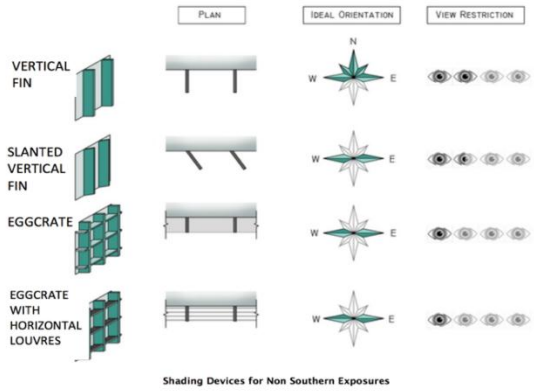


Figure 3. Vertical shading elements [17]

Jennifer Benson from Michigan University mentioned that the shading works are attached importance while

designing the southern facades in her thesis entitled 'Sustainable Strategies for Green Hotel Design'. [18]

In the evaluation of the heating-cooling load criteria, the information that Istanbul is located in the temperate-moist climatic zone was used.

"Istanbul is temperature in summers and is not very cold in winters. The summer seasons are not very arid and the winter seasons are not very severe. The precipitations are dispersed to the seasons. The precipitations are intensified in January, February and June. The hottest months are July, August and September. The amount of precipitation and moisture are high." [19]

According to the definitions in the literature, Istanbul is included within the temperature-moist climatic zone. Koca showed Istanbul within the temperate-moist climatic zone also in the climatic zones map of Turkey for 2006. (Fig. 4) [20]

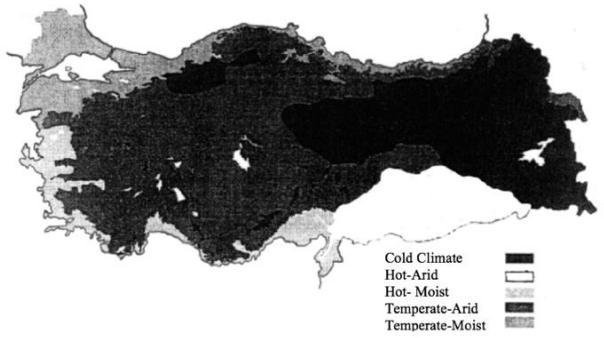


Figure 4. Climatic Zones Map of Turkey [20]

IV. METHOD

1.In order to determine the accommodation building stock in Turkey and Istanbul, the tourism statistical data of the Ministry of Culture and Tourism of the Republic of Turkey for Turkey and Istanbul were examined [1], [2] and added to the study. The purpose of doing so is to clarify the reasons for us to select Istanbul as the region. Istanbul is statistically our province which attracts the tourists most after Antalya in Turkey [2] and this situation manifests itself also in the number of the accommodation buildings. In parallel to the number of the tourists, various types of accommodation buildings were constructed and continue to be constructed. The statistical plentifulness of the accommodation buildings in Istanbul lays a burden on us, the architects, for reducing the energy consumptions of these buildings as of the design moment.

2.The qualified tourism regions in Istanbul obtained from the Ministry of Culture and Tourism of the Republic of Turkey were added to the study. [21]

3.The hotel categorization systems designated by the Ministry of Culture and Tourism of the Republic of Turkey were added to the study. [22]

4.The hotel densities according to the district borders of Istanbul were desired to be designated and for this, the numerical and statistical data of the hotel buildings in Istanbul was obtained from the Ministry of Culture and Tourism [1], [2], [3] and TÜRSAB (Association of Turkish Travel Agencies) [23]; and the location maps of the hotels, however, were obtained from BaşarSoft company (the company name obtained from the general directorate of cartography of Istanbul Metropolitan Municipality). In 2014, the company entered the locations of all accommodation facilities in Istanbul into the digital maps. (Fig. 5)

5. According to the maps obtained from Başarsoft company, the distribution of the hotels in Istanbul by the districts was examined. (Districts by the number of the hotels) In Istanbul, there are 39 districts in 2016. In these districts, the hotel densities vary. There is no homogeneous distribution. The total number of hotels is 1767, namely 830 hotels in Fatih, 280 hotels in Beyoğlu, 16 hotels in Adalar, 3 hotels in Arnavutköy, 20 hotels in Ataşehir, 9 hotels in Avcılar, 12 hotels in Bahçelievler, 22 hotels in Bakırköy, 11 hotels in Bayrampaşa, 6 hotels in Bağcılar, 1 hotel in Başakşehir, 45 hotels in Beykoz, 1 hotel in Beylikdüzü, 39 hotels in Beşiktaş, 22 hotels in Büyükçekmece, 0 hotel in Esenler, 3 hotels in Esenyurt, 10 hotels in Eyüp, 1 hotel in Gaziosmanpaşa, 6 hotels in Güngören, 51 hotels in Kadıköy, 9 hotels in Kartal, 22 hotels in Kağıthane, 13 hotels in Küçükçekmece, 1 hotel in Maltepe, 28 hotels in Pendik, 1 hotel in Sancaktepe, 17 hotels in Sarıyer, 37 hotels in Silivri, 3 hotels in Sultanbeyli, 0 hotel in Sultangazi, 6 hotels in Tuzla, 12 hotels in Zeytinburnu, 4 hotels in Çatalca, 0 hotel in Çekmeköy, 12 hotels in Ümraniye, 15 hotels in Üsküdar, 103 hotels in Şile, 85 hotels in Şişli. (Fig. 5) The accommodation buildings were gathered in Kadıköy, Üsküdar, Beyoğlu, Beşiktaş and Fatih region which is mostly called culture triangle [24]. (Fig. 6)

Figure 5. Locations of the Hotels in Istanbul (Başarsoft)

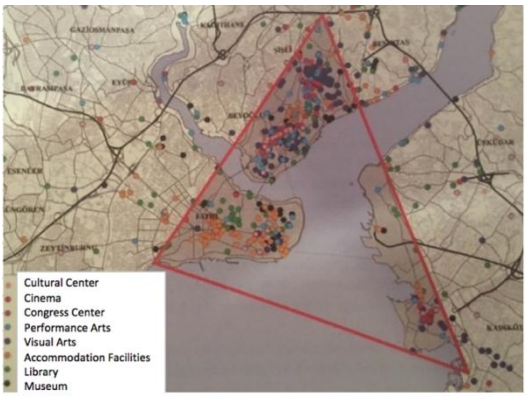


Figure 6. Culture Triangle [24]

The hotel site selection criteria were examined. When the studies for the hotel site selection are examined, it is seen that many studies were carried out due to the reason that the problem is extremely important in terms of the strategical positioning of the establishment. These studies are as follows; "Ertuğral, in his study in relation to the 4- and 5-star hotels within the provincial boundaries of Istanbul, specified the most important factor that separates the accommodation establishments from the other establishments as a result of the frequency analysis as 'its establishment in the regions having touristic attractiveness and characteristics'". [25], "Gray and Liguori expressed that many criteria such as local economic environment, local legislation, building height, vehicle parks, public areas, traffic status and transportation, geographical factors, natural resources and land size should be taken into account in the hotel site selection process." [26], "Urtasun and Gutierrez tried to define the decision process of the hotel site selection by examining characteristics of the hotels which were established between the years of 1936-1998 in Madrid such as geographical location, room price, room size and services rendered." [27]

6. 20 sample hotels were determined. The selection criteria of these 20 hotels:

The hotels;

- *By their locations in Istanbul;*

1. Culture Triangle [24]
2. Historical Peninsula
3. European and Anatolian side Bosphorus
4. European and Anatolian side Marmara Sea
5. European and Anatolian side Black Sea
6. City hotels
7. Airport hotels

- *By their types;*

1. 5-star hotels
2. 4-star hotels
3. 3-star hotels
4. Municipality certificated hotels

- *By their orientations;*

1. East, West, North, South, Northeast, Northwest, Southeast, Southwest

- *By their relationships established with the view;*
- Relationship established with sea
- Relationship established with green area
- Relationship established with historical place
- Relationship established with city

20 hotels were selected so as to meet at least one of the above criteria.

7.The price policies of the hotels in Istanbul by the view were determined. The price of the bedroom orienting to the view is high. (view room price difference 10%)

8. The point wind maps of the hotel bed masses were obtained from the General Directorate of Renewable Energy of the Ministry of Energy and Natural Resources of the Republic of Turkey. For Istanbul, the dominant wind and point (according to the coordinates of the hotels) wind maps were obtained. The point wind maps which were purchased from the General Directorate of Renewable Energy for 20 hotels selected were used in determining the dominant wind directions affecting the facades of the bedroom masses of the hotels, in determining the speeds of the winds to which the facades of the bed masses are exposed, in comparing them with each other and in achieving the information that how many days of the year according to the seasons, at which km/h and from which direction wind blows.

9. As a result of the literature reviews, the orientation criteria of the buildings were determined These criteria are the climatic factors (heating-cooling load, wind), the environmental factors (access to the activity areas, view restrictions, location of the shading elements) and the regulations. [4], [5] The analysis of 20 hotels selected was made by using these criteria.

10. The renewable energy usage indicators were determined through the literature.

11. The results of the analysis were evaluated in terms of the renewable energy usage indicators.

V. Renewable Energy Usage Indicators of the Bed Mass Designs of the Accommodation Buildings

A. Climatic Factors

1) Heating-Cooling Load

- Optimum solar orientation : Wide surface, from south 10 ºsoutheast
- Good orientation ranges : 13 º southwest and 35 º southeast
- Valid orientation ranges : 23 º southwest and 49 º southeast (Fig. 7)
- Settlement direction by the Sun : East-west
- Wind protection/utilization : Giving wide surface to wind [13]

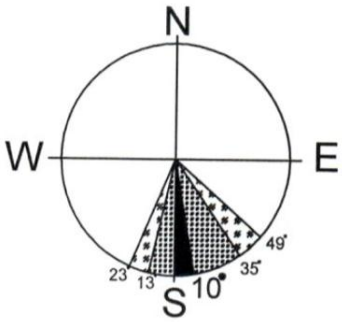


Figure 7. Orientation Ranges [13]

2) Wind

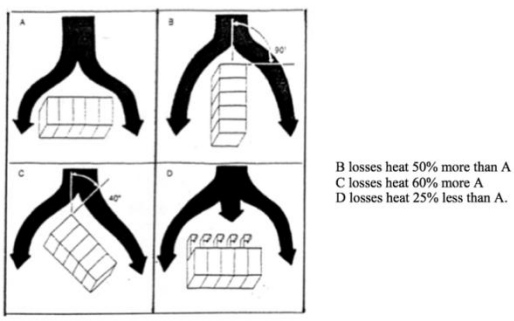


Figure. 8 Wind-Heat Loss [28]

C>B>A>D
For summer months;
Status C → Very Good (status in which the most heat loss occurs)
Status B → Good
Status A → Normal
Status D → Bad
For winter months;
Status C → Bad (status in which the most heat loss occurs)
Status B → Normal
Status A → Good
Status D → Very Good [28]

B. Environmental Factors

1) Activity Zones

Buildings should be at the walking distance to;
-Public transportation,
-Community Resources: Market, Pharmacy, Bank, Business Opportunities(x), Religious and Education Buildings(x), Medical and Social Facilities(x), Recreation Areas(x) and Public Parks(x). [16]

Public Transportation	1 point Yes or No
Shopping	1 point Yes or No
Pharmacy	1 point Yes or No
Hospital Building	1 point Yes or No
Bank	1 point Yes or No
Religious Building	1 point Yes or No

General Orientation: Total point = ? point
6-Very good
5-Good
4-Normal
3-Bad
2-Very bad
0-1-Invalid

2) View Restrictions and Price Policies

- Relationship established with sea
- Relationship established with green area
- Relationship established with historical place
- Relationship established with city

The resource is the conclusions that we drew from the orientations of the hotels in Istanbul.

3) Location of the Shading Elements

- Trees (deciduous high-trunk trees in south) [17]
- Horizontal shading elements (Horizontal shading element in south) [17] (Fig. 2)
- Vertical shading elements (Vertical shading element in west and east) [17] (Fig. 2)
- Nearby buildings
- Balconies

C) Regulations

The regulations related to orientation in Turkey are given below and are insufficient.

In accordance with "the Green Star Certificate" of the Ministry of Culture and Tourism of the Republic of Turkey;

- There should be available shading elements in the exterior facade of the building. [29] 1 Point

In accordance with ÇEDBİK housing certificate guide;

- The natural ventilation methods should be given priority and for this, care should be taken to design the building clearances according to the dominant wind direction. [30] 1 Point

2 point = Good
1 point = Valid
0 point = Invalid

VI. Field Study: Evaluation of the Bed Masses of 20 Hotels in Istanbul in Terms of the Renewable Energy Usage Indicators and Tabulation of Their Analyses

The bed masses of 20 hotels in Istanbul were evaluated in terms of the renewable energy usage indicators and were tabulated. (Table. II, III, IV, V, VI, VII) Although the dominant view is within the optimum, good and valid orientation limits in the article, Phellos Suites which has invalid orientation despite it orients to the view and also Sheraton Istanbul Ataköy Hotel which the dominant view is within the optimum, good and valid orientation limits as advantage and this was evaluated and 60% of the bedroom masses were positioned within the good and valid orientation range were detailed in the article.

A. Analysis of Phellos Suites Orientation Decisions in terms of the Renewable Energy Usage Indicators

Phellos Suites was analyzed in accordance with the criteria of the above orientation decisions. If we start to examine according to the climatic factors; when we make the building heating-cooling load analysis, we see that none of the bedroom masses ensures the optimum orientation to 10° southeast from south, the good orientation to 13° southwest and 35° southeast and the valid orientation to 23° southwest and 49° southeast. All of the bedroom masses have invalid orientation. (Fig. 7) Although the sea view which is the dominant view (it also increases the price) is within the optimum orientation limits, the optimum orientation could not be ensured. (Table II)

When we examine the point wind map of the building, we see that the dominant wind blows towards to the long facade. This corresponds to the status A in accordance with the wind evaluation criteria. (Fig. 8) While the building has normal orientation in terms of wind according to our evaluation system because the heat loss is a desired situation for the summer months, the heat loss is an undesired situation for the winter months and in this case, the building has good orientation for the winter months. (Table III)

When we examine the environmental factors which are one of the orientation decisions of the building, we see that the building is at the walking distance to the public transportation, the shopping opportunities, the bank, religious buildings, the pharmacy and hospital buildings in the activity zones analysis. It meets 6 of 6 factors in total. In this case, the building has very good orientation in the activity zones analysis in accordance with the activity zones criteria. (Table IV)

If we examine the view restrictions, while the building has sea and green area view, it has not historical area and city view. It has two of four view criteria. (Table VI)

While there is no deciduous high-trunk tree in the southern facade of the building, there are horizontal shading elements. In the western and eastern facades, there are vertical shading elements. The nearby buildings do not cast a shadow upon the bedroom facades. In the bedroom masses, there is balcony. The bedroom facades of the building are protected against the cooling load increasing effects of the sun with the shading elements. (Table VI)

If we examine the regulations, the building meets the criterion that there should be shading elements in its exterior facade and the criterion that the building clearances should be designed according to the dominant wind direction. (Table VII)

B. Analysis of Sheraton Istanbul Ataköy Hotel Orientation Decisions in terms of the Renewable Energy Usage Indicators

Sheraton Istanbul Ataköy Hotel was analyzed in accordance with the criteria of the above orientation decisions. If we start to examine according to the climatic factors, when we make the heating-cooling load analysis of the building, while none of the bed masses ensures the optimum orientation to 10 ºsoutheast from south, 50% of the building bed masses ensure the good orientation to 13 º southwest and 35 º southeast and 10% ensures the valid orientation to 23 ºsouthwest and 49 ºsoutheast. 40% of the building bed masses does not meet any orientation requirement. (Fig. 7) Although the sea view which is the dominant view (it also increases the price) is within the optimum orientation limits, the optimum orientation could not be ensured, but 60% of the building bed masses ensures the good and valid orientation and the sample has the best orientation among 20 hotels. (Table II)

When we examine the point wind map of the building, we see that the dominant wind blows to the building with approximately 40 ºangle. This corresponds to the status C according to the evaluation system. (Fig. 8) While the building has very good orientation in terms of wind according to the evaluation system because the heat loss is a desired situation for the summer months, the heat loss is an undesired situation for the winter months and in this case, the building has bad orientation for the winter months. (Table III)

When we examine the environmental factors which are one of the orientation decisions of the building, we see that the building is at the walking distance to all of the public transportation, the shopping opportunities, the pharmacy, the hospital buildings, the bank and religious buildings in the activity zones analysis. The building meets 6 of 6 factors in total. In this case, the building has very good orientation in the activity zones analysis according to the evaluation system (Table IV)

If we examine the view restrictions, the building has sea, green area and city views. It meets 3 of 4 view requirements. (Table V)

There is no deciduous high-trunk tree and horizontal shading elements in the southern facade of the building. In the western and eastern facades, there is also no vertical shading element. The nearby buildings do not cast a shadow upon our bedroom facades. In the bedroom masses, there is also no balcony. The building has none of the shading elements. This causes the cooling load to increase in summer. (Table VI)

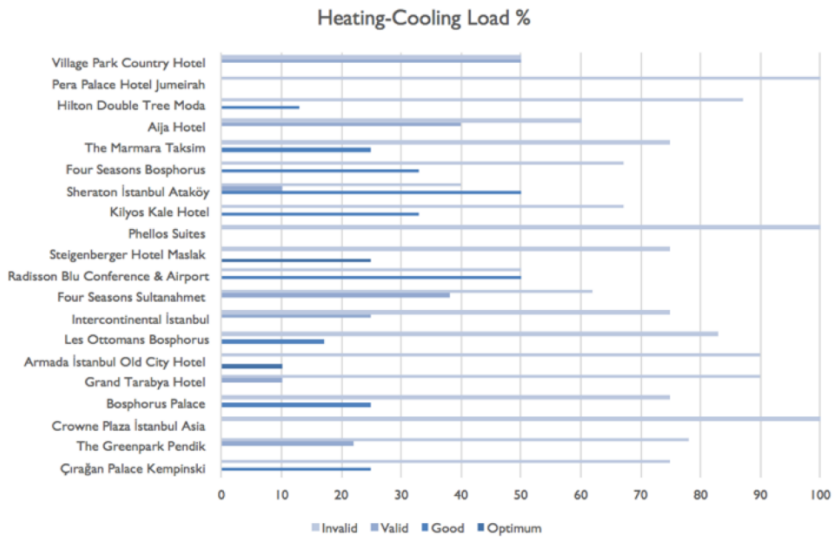
If we examine the regulations, while the building does not meet the criterion that there should be shading elements in the exterior facade, it meets the criterion that the building clearances should be designed according to the dominant wind direction. (Table VII)

VII. Conclusion

When we examine the orientation decisions of the bedroom masses of 20 sample hotels in Istanbul;

Heating-Cooling Load Analysis; there are bedroom masses so as to ensure the optimum orientation in 2 of the bedroom masses of 20 hotels, the good orientation in 9 and the valid orientation in 7. In all of 20 hotels, there are rooms which have invalid orientation.

TABLE II. Heating-Cooling Load Analysis



Although the sea view which is the dominant view (it also increases the price) is within the optimum orientation limits for 14 of 20 hotels, the optimum orientation could not be ensured. In 2 of them, both the orientation to the view was ensured and the optimum orientation was ensured. In 4 of them, the optimum orientation could not be ensured even though there is no view concern. (Table II)

In the wind analysis, for the summer months, 8 hotels have very good orientation, 7 hotels have good orientation, 5 hotels have normal orientation and none of the hotels has bad orientation. For the winter months, 5 hotels have good orientation, 7 hotels have normal orientation and 8 hotels have bad orientation. (Table III)

In the activity zones analysis; 15 hotels are at the walking distance to all activity zones. 3 hotels are at the walking distance to public transportation, the shopping, the bank, the religious building and the pharmacy. 1 hotel is at the walking distance to public transportation, the shopping, the bank and the religious building. 1 hotel is at the walking distance none of activity zones. (Table IV)

In the view restrictions analysis; 12 of 20 sample hotels have all of the sea, green area, historical area and city views. 2 of them have the sea, green area and city views; 2 of them have the sea and green area views; 1 of them has sea and city views; 1 of them has only the green area view; and 2 of them have only the city view. (Table V)

1 of 20 hotels has tree, horizontal shading element, vertical shading element and balcony, 3 of them have horizontal shading element, vertical shading element and balcony, 6 of them have only horizontal shading element, 1 of them has only vertical shading element, 2 of them have only balcony. The remaining 7 hotels have no shading element. (Table VI)

While 13 of 20 hotels comply with 2 regulations, 7 of them comply with only one regulation. (Table VII)

TABLE III. WIND ANALYSIS

Wind Analysis		
Hotels	**Condition Analysis for Summer**	**Condition Analysis for Winter**
Çırağan Palace Kempinski	Good	Normal
The Greenpark Pendik	Normal	Good
Crowne Plaza İstanbul Asia	Normal	Good
Bosphorus Palace	Normal	Good
Grand Tarabya Hotel	Very Good	Bad
Armada İstanbul Old City Hotel	Good	Normal
Les Ottomans Bosphorus	Very Good	Bad
Intercontinental İstanbul	Normal	Good
Four Seasons Sultanahmet	Good	Normal
Radisson Blu Conference & Airport	Very Good	Bad
Steigenberger Hotel Maslak	Very Good	Bad
Phellos Suites	Normal	Good
Kilyos Kale Hotel	Very Good	Bad
Sheraton İstanbul Ataköy	Very Good	Bad
Four Seasons Bosphorus	Good	Normal
The Marmara Taksim	Very Good	Bad
Aija Hotel	Good	Normal
Hilton Double Tree Moda	Very Good	Bad
Pera Palace Hotel Jumeirah	Good	Normal
Village Park Country Hotel	Good	Normal

TABLE IV. ACTIVITY ZONES ANALYSIS

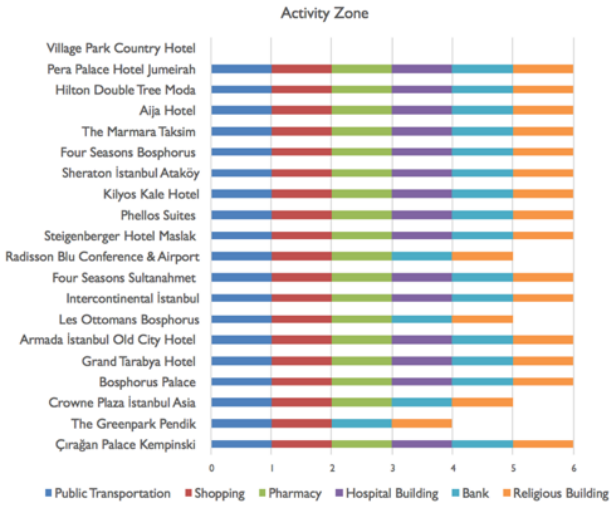


TABLE V. VIEW RESTRICTIONS ANALYSIS

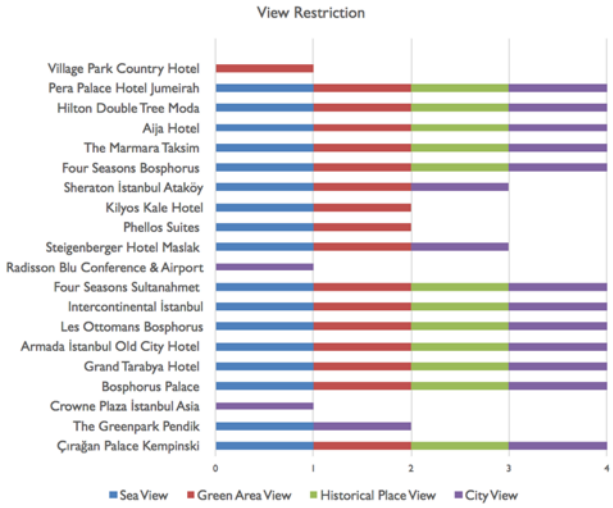


TABLE VI. SHADING ELEMENTS ANALYSIS

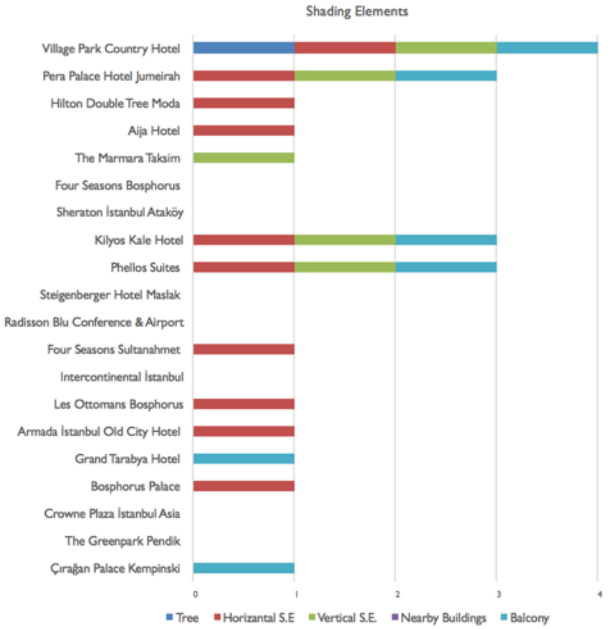
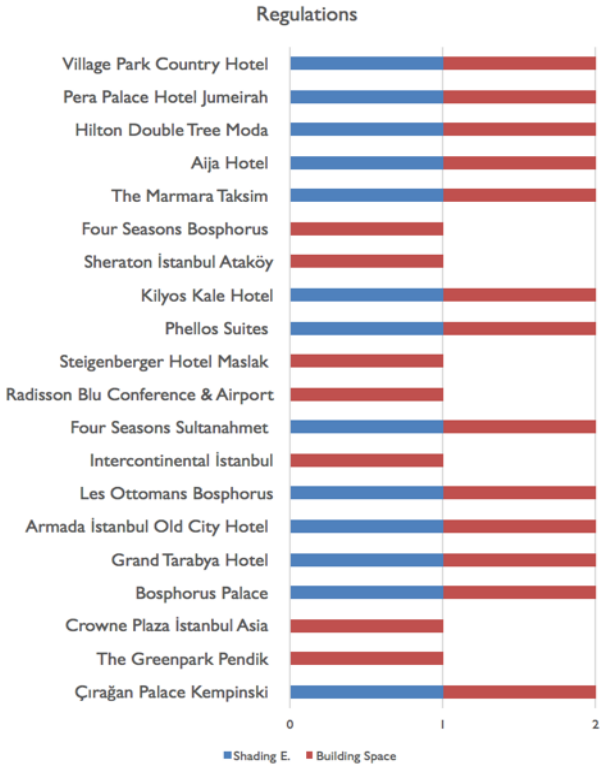


TABLE VII. REGULATIONS



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