

ERZURUM

ECOLOGY AND ARCHITECTURE IN ERZURUM

ARC0104-ECOLOGY AND ARCHITECTURE

INSTRUCTOR : PROF. DR. FİLİZ BAL KOÇYİĞİT

PRESENTATION DATE: 11.01.2023

1800003491 BERFİN ÇORAK

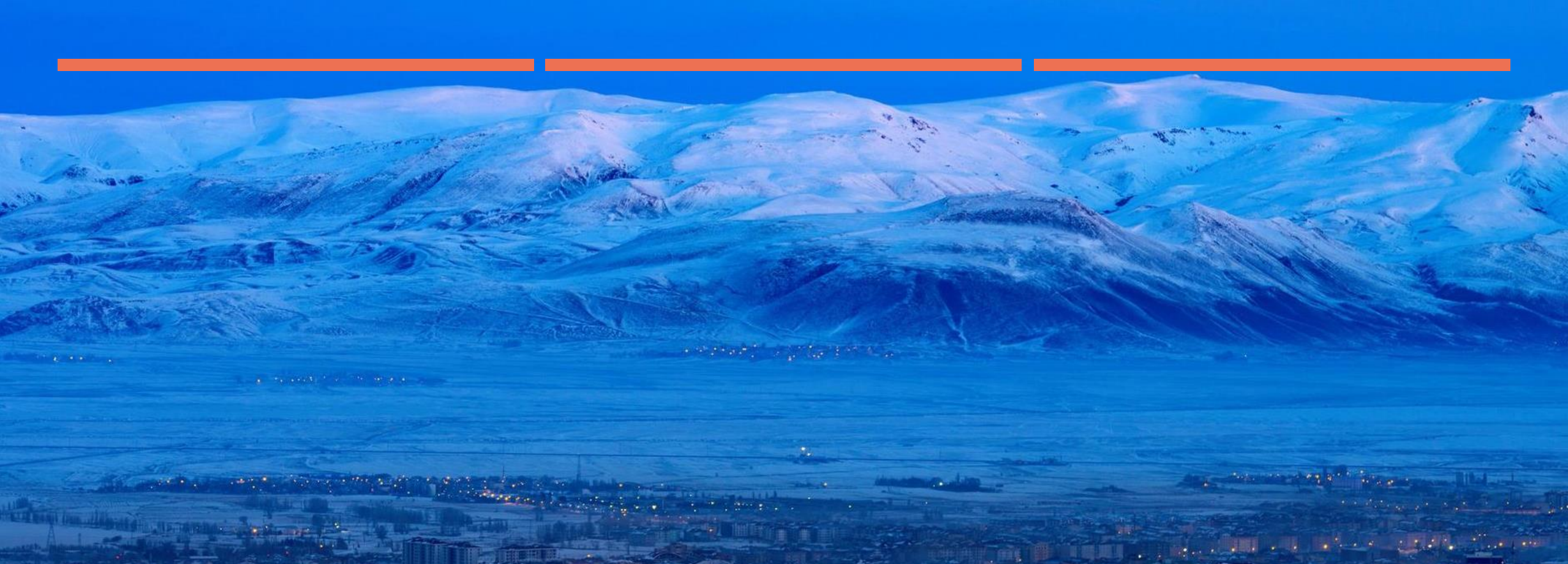
1700001705 ÜLKÜ NUR TOPSAKAL

1700002465 TUĞBA DENİZ BALCIOĞLU

CONTENT

- GENERAL INFORMATION ABOUT ERZURUM
- CLIMATE ANALYSIS OF ERZURUM
- ARCHITECTURE IN ERZURUM
- ERZURUM HOUSE PLAN TYPE
- LOCAL MATERIALS



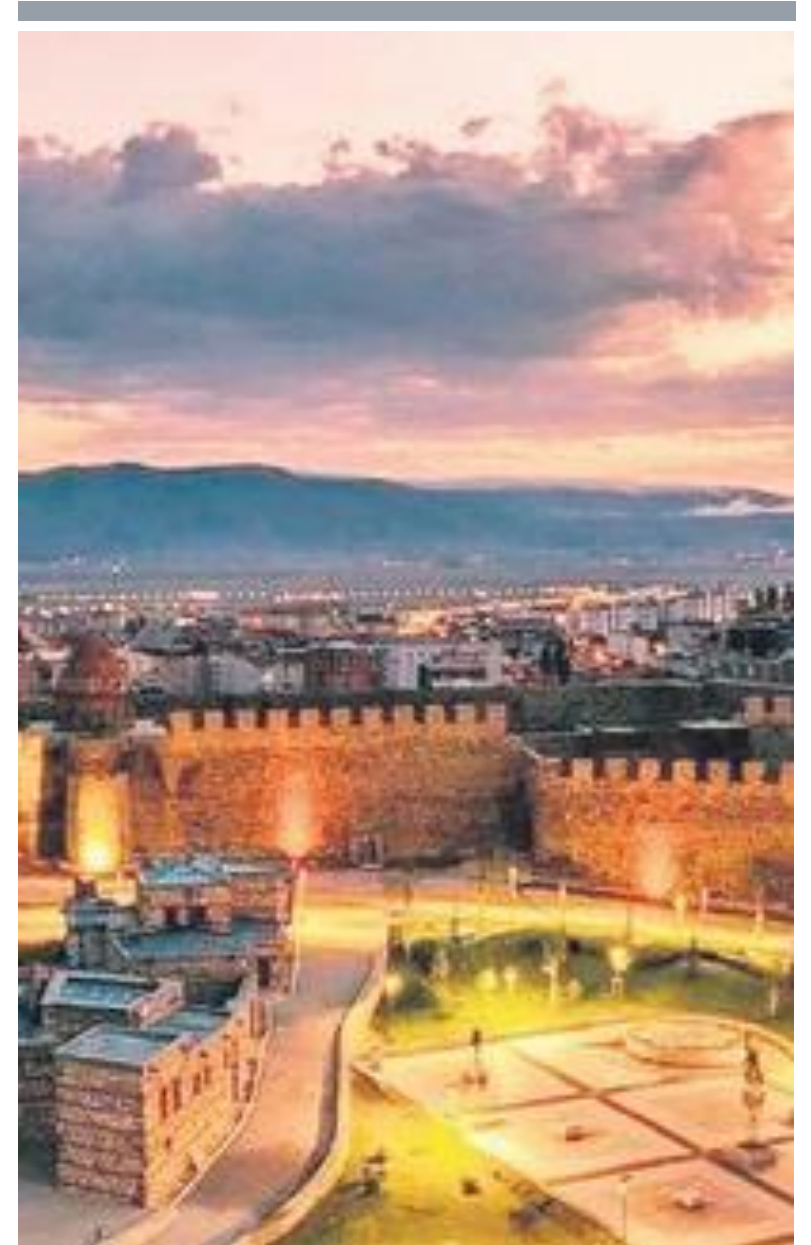


ERZURUM



ERZURUM

- Erzurum city, which was established on the southeast edge of the Erzurum plain, at the contact area of this plain and Palandöken mountain, is the third largest province of the Eastern Anatolia Region with a population of 758,279. Erzurum, which is about 1900 m above sea level, has been a settlement since the first periods of history. The city is also known for its historical monuments and winter sports facilities.
- Except for the northern parts of the province in the Black Sea Region, most of it is located in the Eastern Anatolia Region and has a continental climate. The high altitude of Erzurum and the heavy snowfall (snow remains on the ground for 70 days of the year) cause the sun's rays to be reflected back into space. Therefore, although Erzurum is one of the sunniest provinces in Turkey, it is one of the coldest provinces. While the temperature reaches +35 degrees in summer, the temperature drops down to -30 degrees in winter.



ERZURUM

In Turkey,

For the purposes of building design four basic types, is adequate.

1. Hot – humid
2. Hot – arid
3. Temperate – humid
4. Temperate -arid
5. Cold

Maximum U values according to zones:

Bölgelere göre en fazla değer olarak kabul edilmesi tavsiye edilen U değerleri

	U_D (W/m ² K)	U_T (W/m ² K)	U_f (W/m ² K)	U_p^* (W/m ² K)
1. Bölge	0,70	0,45	0,70	2,4
2. Bölge	0,60	0,40	0,60	2,4
3. Bölge	0,50	0,30	0,45	2,4
4. Bölge	0,40	0,25	0,40	2,4

wall

roof

floor

window

Annex K

(for information)

Our provinces according to the degree day regions



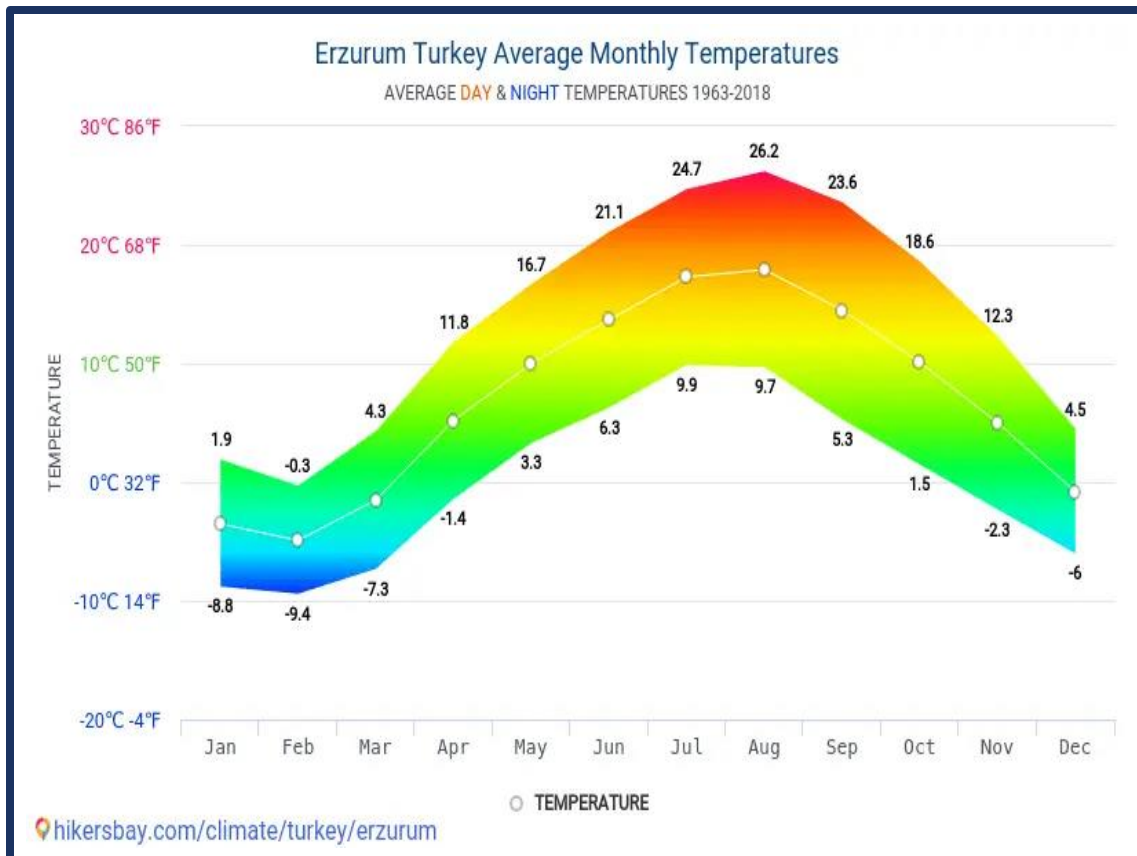
1. Bölge 2. Bölge 3. Bölge 4. Bölge

01- ADANA	10- BALIKESİR	19- ÇORUM	28- GRESUN	37- KASTAMONU	46- K.MARAŞ	55- DUTLU	64- UŞAK	73- ŞIRNAK
02- ADYAMAN	11- BILECEK	20- DENİZLİ	29- GÜMÜŞHANE	38- KAYSERİ	47- MARDİN	56- SİRT	65- VAN	74- BARTIN
03- AFYON	12- BİNGÖL	21- DİYARBAKIR	30- HAKKARİ	39- KIRKLARELİ	48- MUĞLA	57- SİNOP	66- YOZGAT	75- ARDAHAN
04- AĞRI	13- BITLİS	22- EDİRNE	31- HATAY	40- KIRŞEHİR	49- MUŞ	58- SİVAS	67- ZONGULDAK	76- İZMİR
05- AMASYA	14- BOLU	23- ELAZIĞ	32- ISPARTA	41- KOCAELİ	50- NEVŞEHİR	59- TEKİRDAĞ	68- ANKARA	77- YALOVA
06- ANKARA	15- BURDUR	24- ERZİNCAN	33- İCEL	42- KONYA	61- NIĞDE	60- TOKAT	69- BAYBURT	78- KARABÜK
07- ANTALYA	16- BURSA	25- ERZURUM	34- İSTANBUL	43- KÜTAHYA	62- ORDU	61- TRABZON	70- KARAMAN	79- KİLİS
08- ARTVİN	17- ÇANAKKALE	26- ESKİŞEHİR	35- İZMİR	44- MALATYA	63- RİZE	62- TUNCELİ	71- KIRSEKİLE	80- OSMANIYE
09- AYDIN	18- ÇANIRI	27- GAZİANTEP	36- KARS	45- MANİSA	64- SAKARYA	63- ŞANLIURFA	72- BATMAN	81- DÜZCE

An aerial photograph of Erzurum, Turkey, during winter. The city is densely packed with buildings, many of which have snow on their roofs. In the background, large, rugged mountains are covered in a thick layer of snow. The sky is overcast and grey. A dark blue horizontal bar is positioned at the top of the image, and a larger dark blue rectangular box is at the bottom, containing the title text.

CLIMATE ANALYSIS OF ERZURUM

CLIMATE ANALYSIS IN ERZURUM



- Erzurum province is one of the highest and coldest provinces of Turkey. A harsh continental climate prevails. Winters are very cold and snowy, summers are very hot and dry. It is covered with snow 150 days of the year. The amount of precipitation is 460 mm. Melting snow feeds the streams.
- Erzurum is green in spring, white in winter, and yellow in summer and autumn (steppe). Forests and heaths make up 9% of the surface area. It consists of scotch pine and oak trees at an altitude of 1900-2000 m. Meadows and pastures cover 68% of the land, while cultivated and planted land is 18%. The forests are on the south-facing slopes of the mountains in the north.

CLIMATE ANALYSIS

COLD CLIMATE

Temperature:

• Around 18 °C – 25 °C in summer, between -2 °C, -12 °C in winter

• Average temperature of the coldest month is under -15° C

• The lowest temperature of year is under -40° C

Relative humidity : High

Summers: Cool

Winters: Snowfall and frost is seen

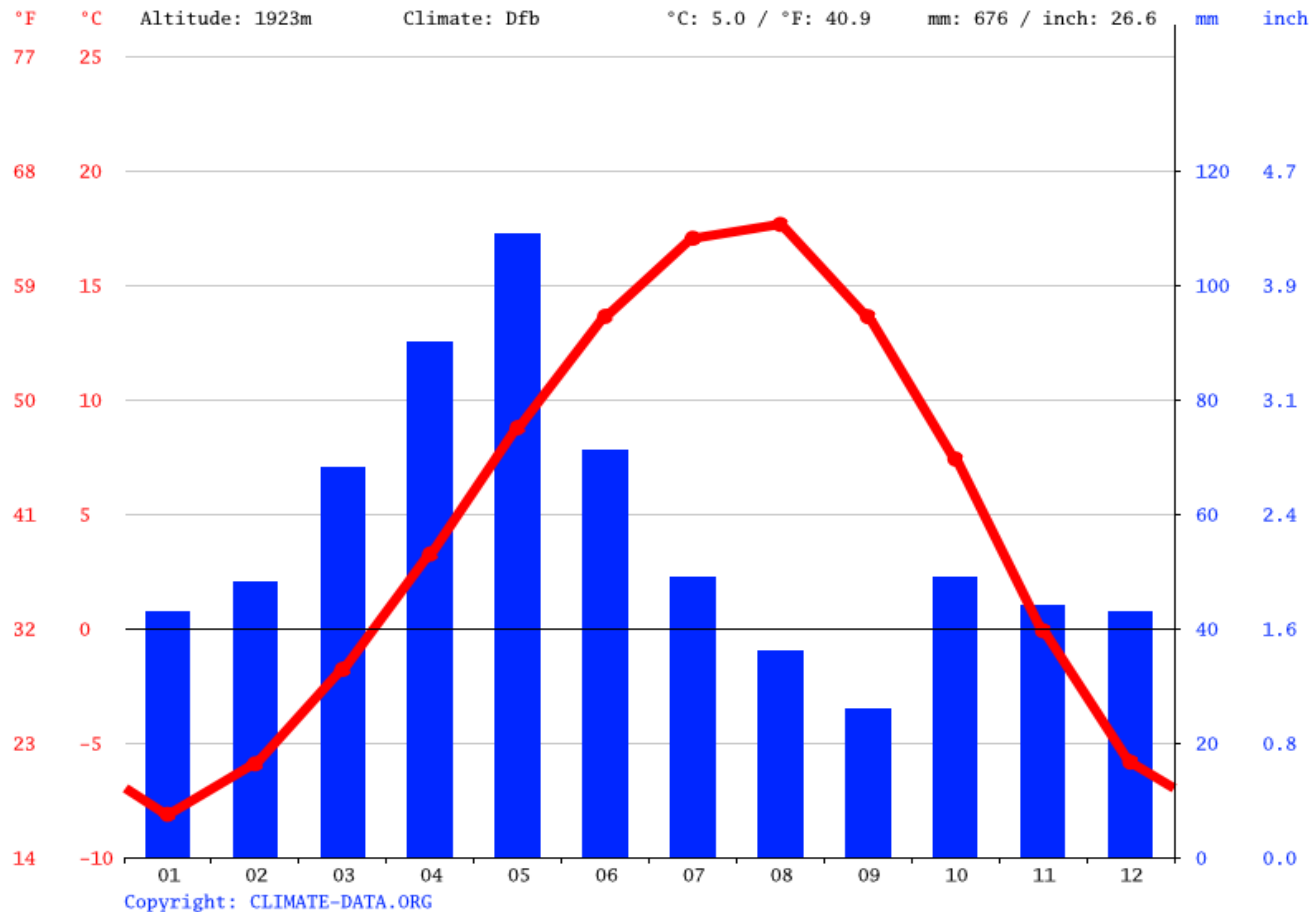
Elements Required Protection

- Wind
- Cold snowdrift
- Snow load

Elements Which Should Be Provided

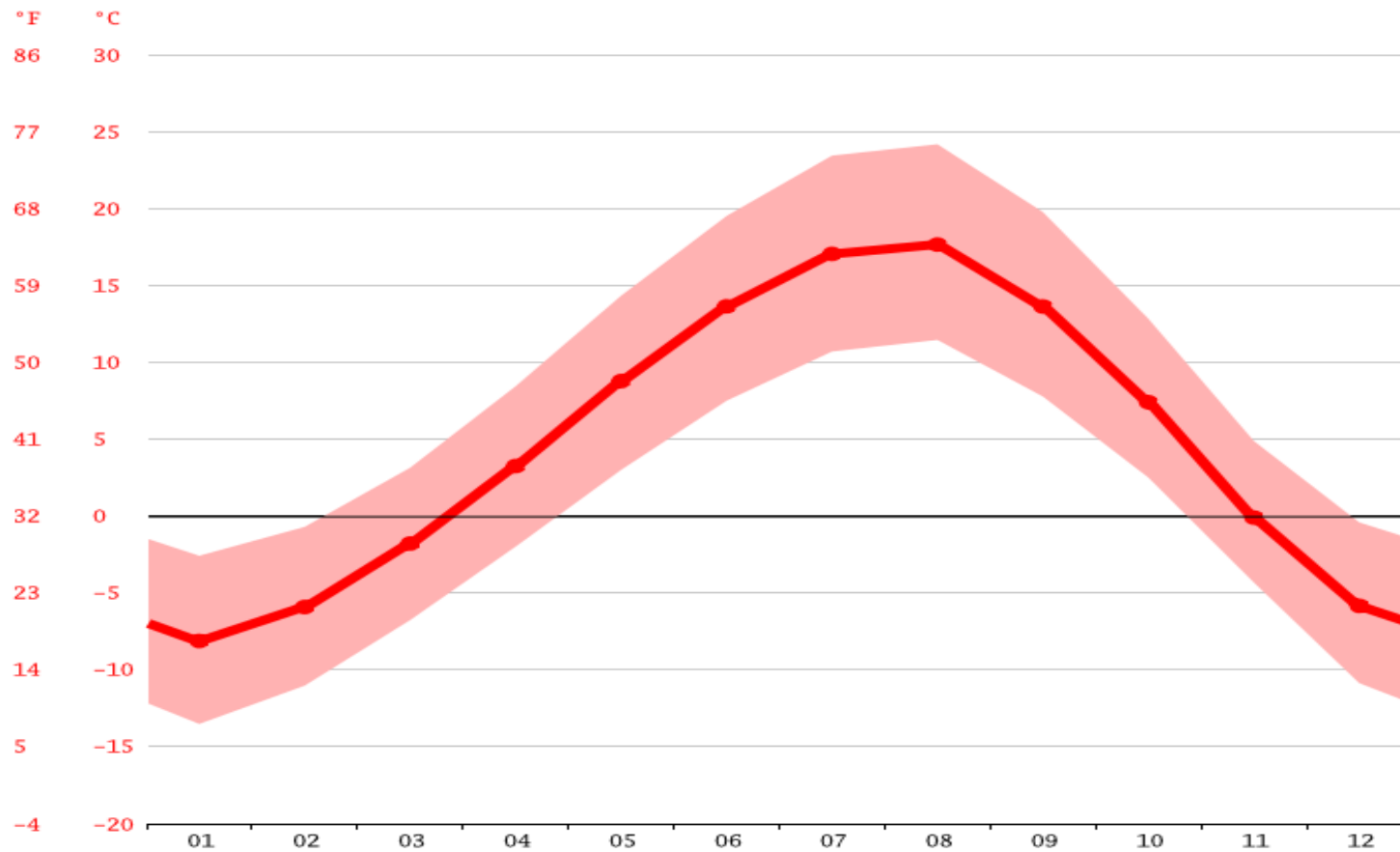
- Minimum heat loss
- Maximum utilization from sun in winters
- Maximum sun exposure orientation - Sunspace
- Compact for design – minimum surface area
- Protection from cold wind – barrier, vegetation...
- Thermal insulation
- Thermal mass (trombe wall)
- Controlled ventilation (direction, duration)
- Small openings from north façade (protection from cold)
- Absorbent surface material
- Slopped roof design in order to get rid of snow load

CLIMATE GRAPHIC



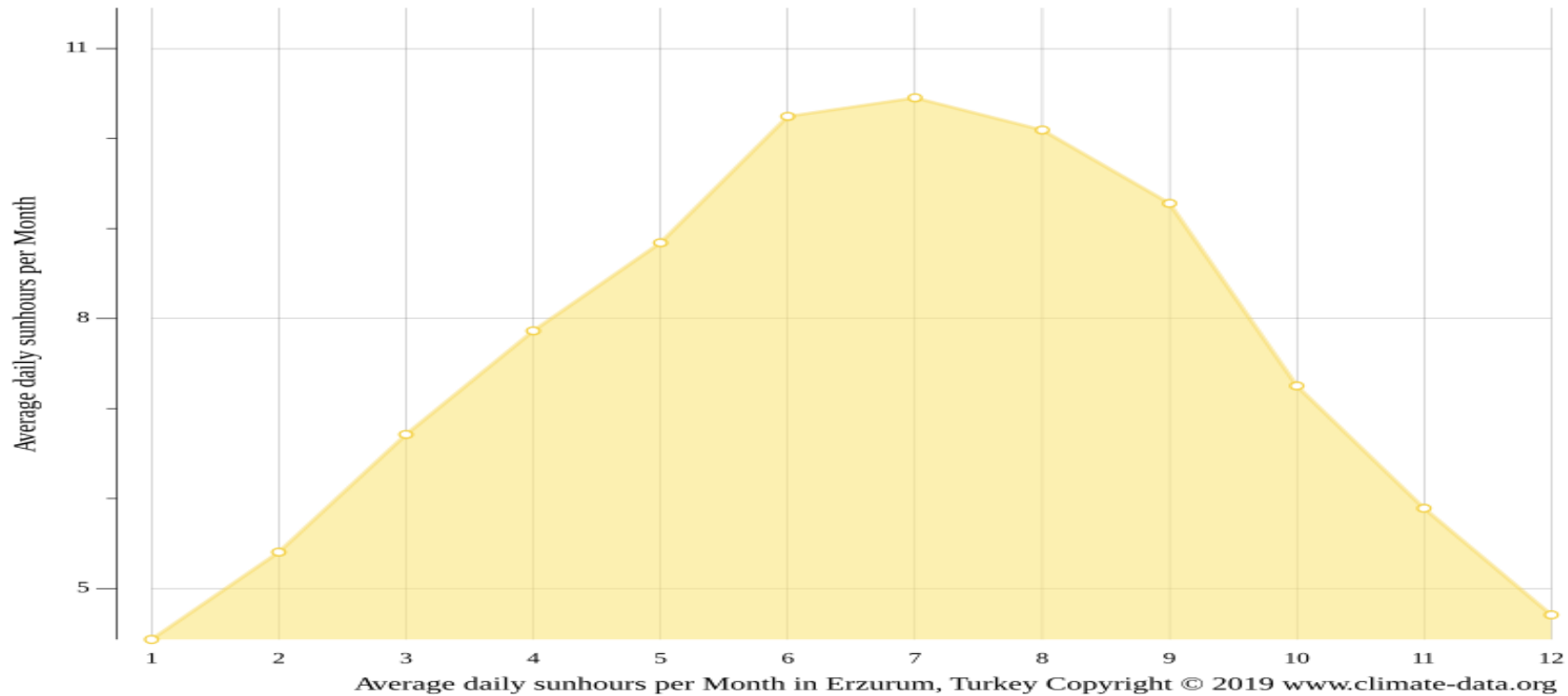
- With 26 mm of precipitation, September is the driest month of the year. With an average of 109 mm precipitation, the highest precipitation is seen in May.

TEMPERATURE GRAPHIC



- With a temperature of 17.6 °C, August is the hottest month of the year. The average temperature in January is -8.1 °C, which is the lowest average of the year.

HOURS OF SUNSHINE



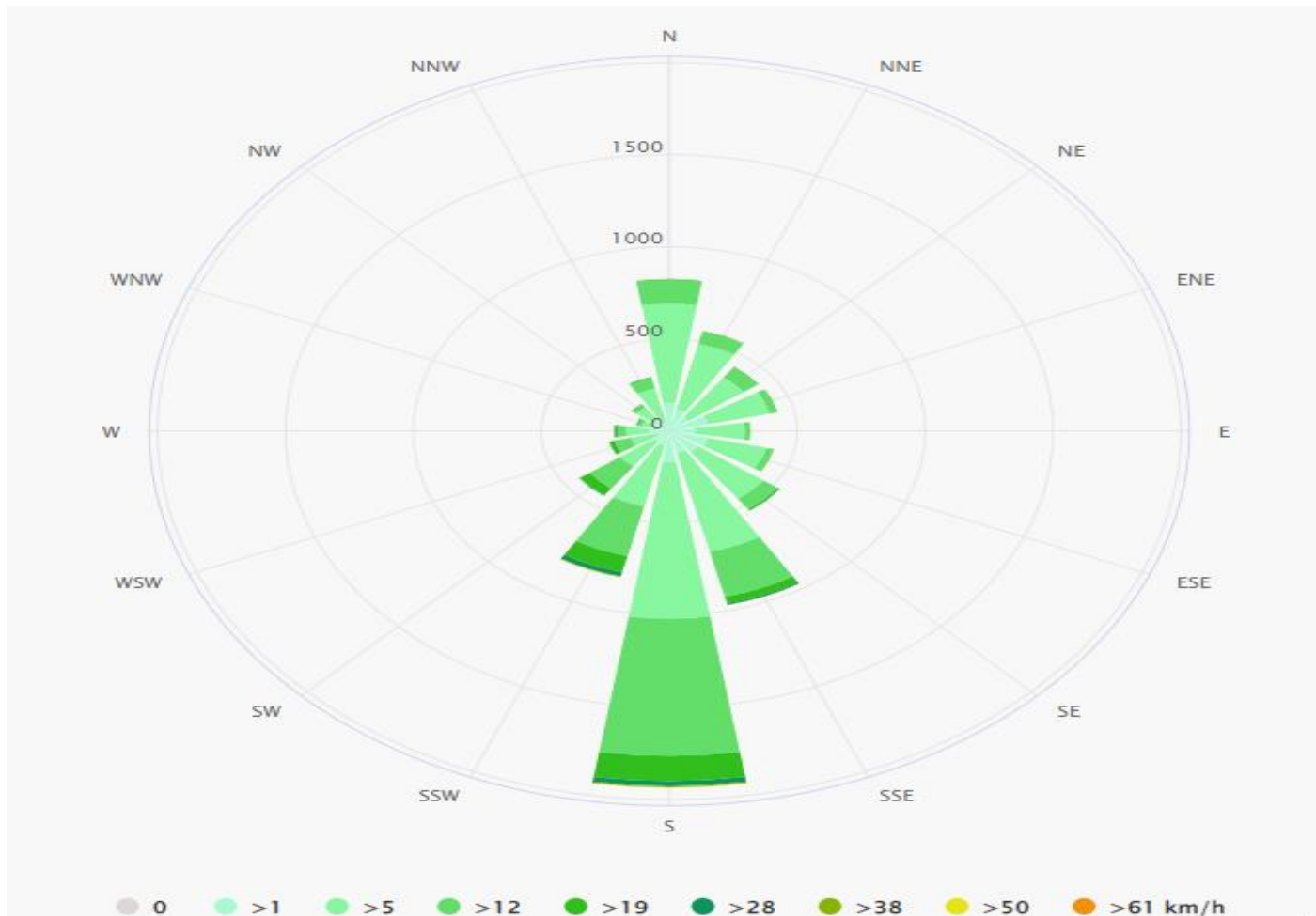
- There is an average of 10.45 hours of sunshine per day in July and a total of 324.02 hours of sunshine during July.
- In January there is an average of 4.71 hours of sunshine per day and a total of 145.95 hours of sunshine.

CLIMATE TABLE

	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık
Ort. Sıcaklık (° C)	-8.1	-5.9	-1.8	3.2	8.8	13.6	17	17.6	13.6	7.4	-0.1	-5.8
Min. Sıcaklık (° C)	-13.5	-11	-6.8	-2	3	7.5	10.7	11.4	7.8	2.5	-4.3	-10.9
Maks. Sıcaklık (° C)	-2.8	-0.7	3.1	8.4	14.3	19.5	23.4	24.2	19.8	12.8	4.9	-0.4
Yağış / Yağış (mm)	43	48	68	90	109	71	49	36	28	49	44	43
Nem(%)	74%	73%	71%	71%	67%	61%	59%	55%	51%	62%	67%	72%
Yağmurlu günler (g.)	6	7	9	12	15	9	7	6	4	7	5	6
Güneşli saatler (s)	4.4	5.4	6.7	7.9	8.8	10.2	10.5	10.1	9.3	7.3	5.9	4.7

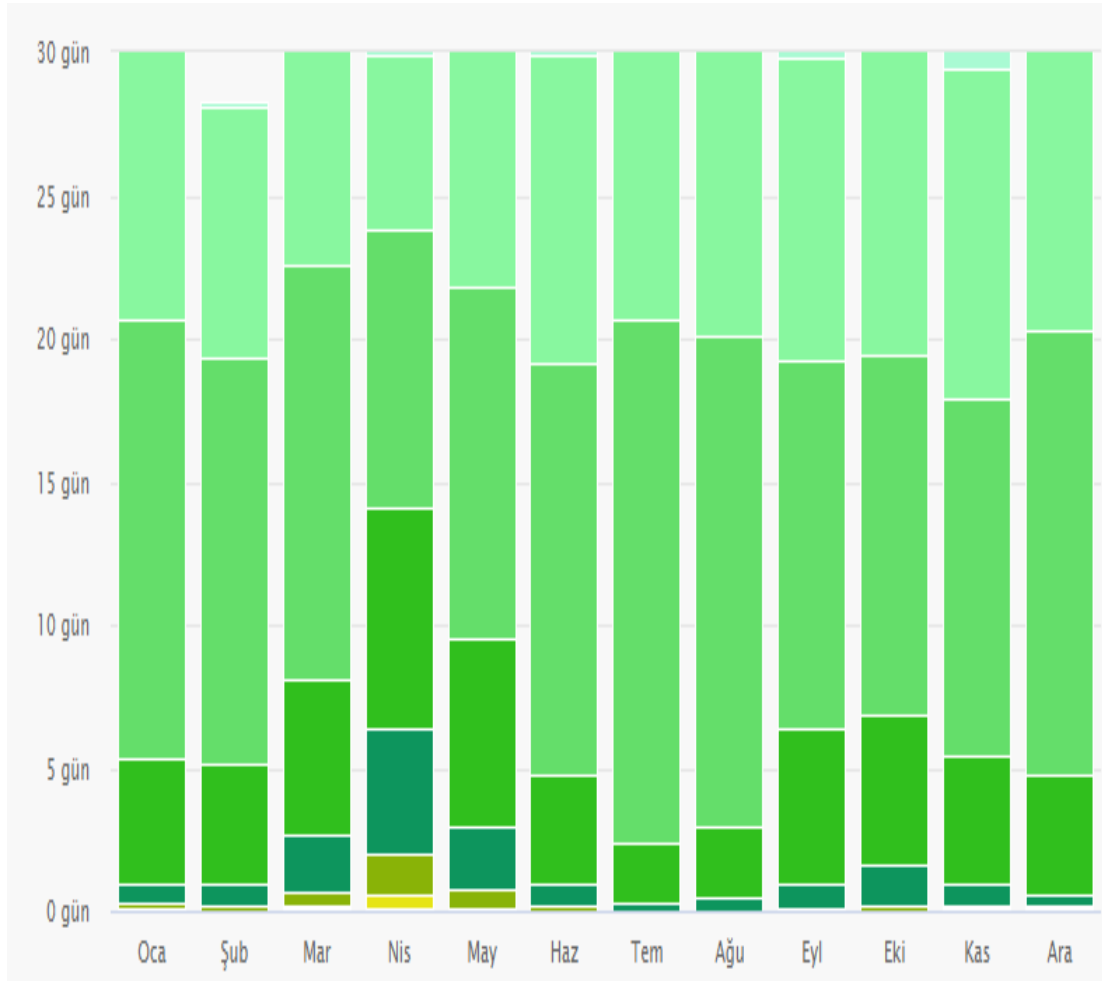
- The amount of precipitation between the driest and wettest months of the year: 83 mm The average temperature varies around 25.8 °C throughout the year.
- Summer starts here at the end of Haziran and ends in Eylül.

WIND ROSE



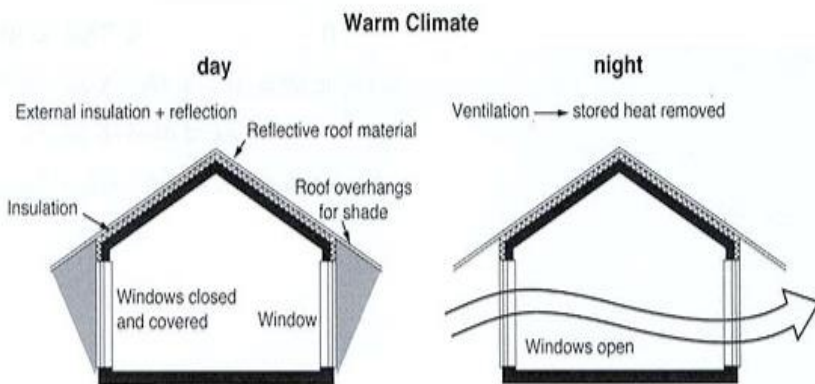
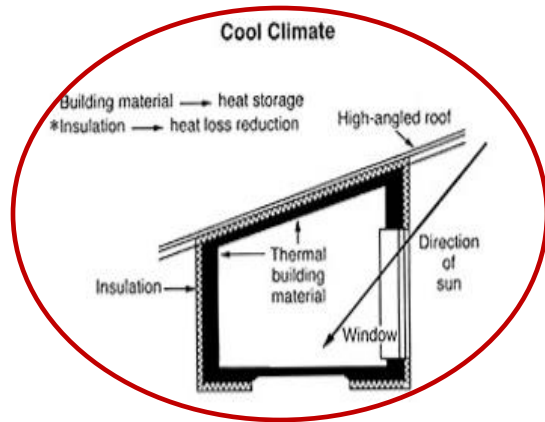
- The wind rose for Erzurum shows how many hours per year the wind blows from the indicated direction.

WIND SPEED

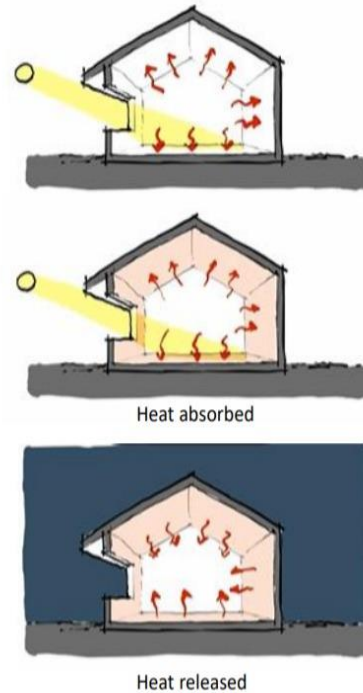


- The diagram for Erzurum shows the days per month, during which the wind reaches a certain speed.

CLIMATE ANALYSIS

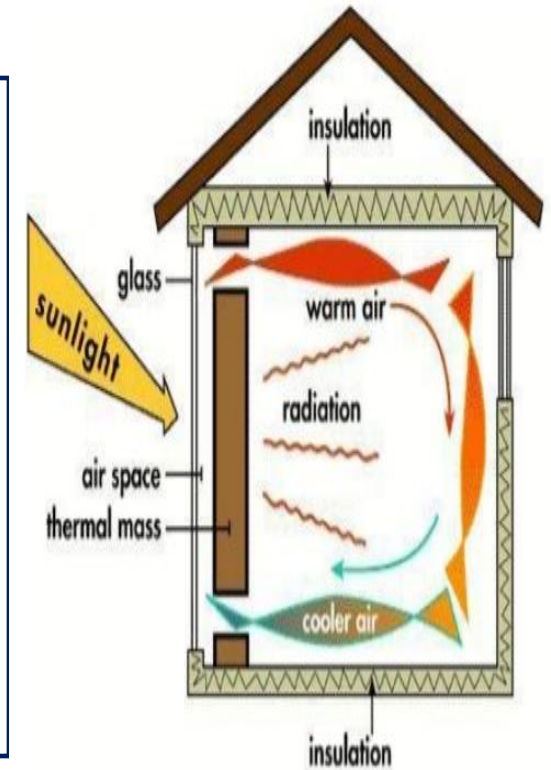


Thermal Mass



-Thermal mass is the material's capacity to absorb, store and release heat.

-It is useful for storing solar heat energy. Room temperatures remain relatively stable throughout the year, and as a result less energy is required to heat or cool rooms.





ARCHITECTURAL FEATURES OF ERZURUM HOUSES

ARCHITECTURAL FEATURES OF TRADITIONAL ERZURUM HOUSES

- The architecture of Erzurum houses consists of traditional building types completely dependent on the climate. The city is located at an average altitude of 1850 meters and is located in the southern part of the plain surrounded by mountains. Erzurum houses are a product of the city's rich geography, historical and cultural environment, and especially the life, climate and building materials have influenced the design of the house.
- Erzurum houses have emerged as a house type that fits the architecture of Turkish houses but has its own characteristics. It can be said that Erzurum houses were built in three main plans. These; They are single-storey, two-storey, multi-section or mansion type plans.
- While the climate necessitates the construction of Erzurum houses in a way that will heat up easily and cool down late, the geography necessitated the use of stone as the main building element of these houses.
- The main element of Erzurum houses is stone. It is a building material that changes according to the characteristics of the place where it is used in stone houses. Stones called rubble were used on the facades and in the corners, and on other parts. The stones used in the construction of Erzurum houses are black stone, camber and gray stone.
- Stone houses, which are as strong as Erzurum castle, are wooden. The wooden elements that carry and connect the walls are called beams, and those that carry the roof that covers the house are called beams. Door, window joinery and floor coverings were also made of wood..
- The most interesting feature of Erzurum houses are their roofs. Generally, vertically rising roofs are used in regions where the winter climate is dominant, whereas in Erzurum houses, the roof problem is solved with the sloping roofs covered with soil, thatch and reed heaps.

ROOMS OF TRADITIONAL ERZURUM HOUSES

- SOFA
- MUTFAK
- HELA (TOILET)
- KİLER
- AHIR
- MEREK (SAMANLIK)



Building Elements

Examples

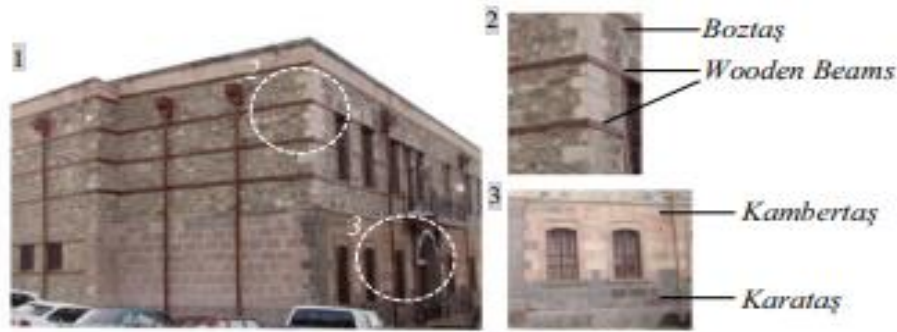
Walls

-Dressed-stone, and rubble stone from local stones; *Karataş*, *Boztaş*, *Kambertaş*

-Wooden beams

-80-100 thickness

-Plastered with lime mortar or clay



Roofing

-Earth, wood, stones



Architectural Elements

Examples

Doors

Metals; bronze and iron, Wood; pine, poplar, willow, and also reed and cane

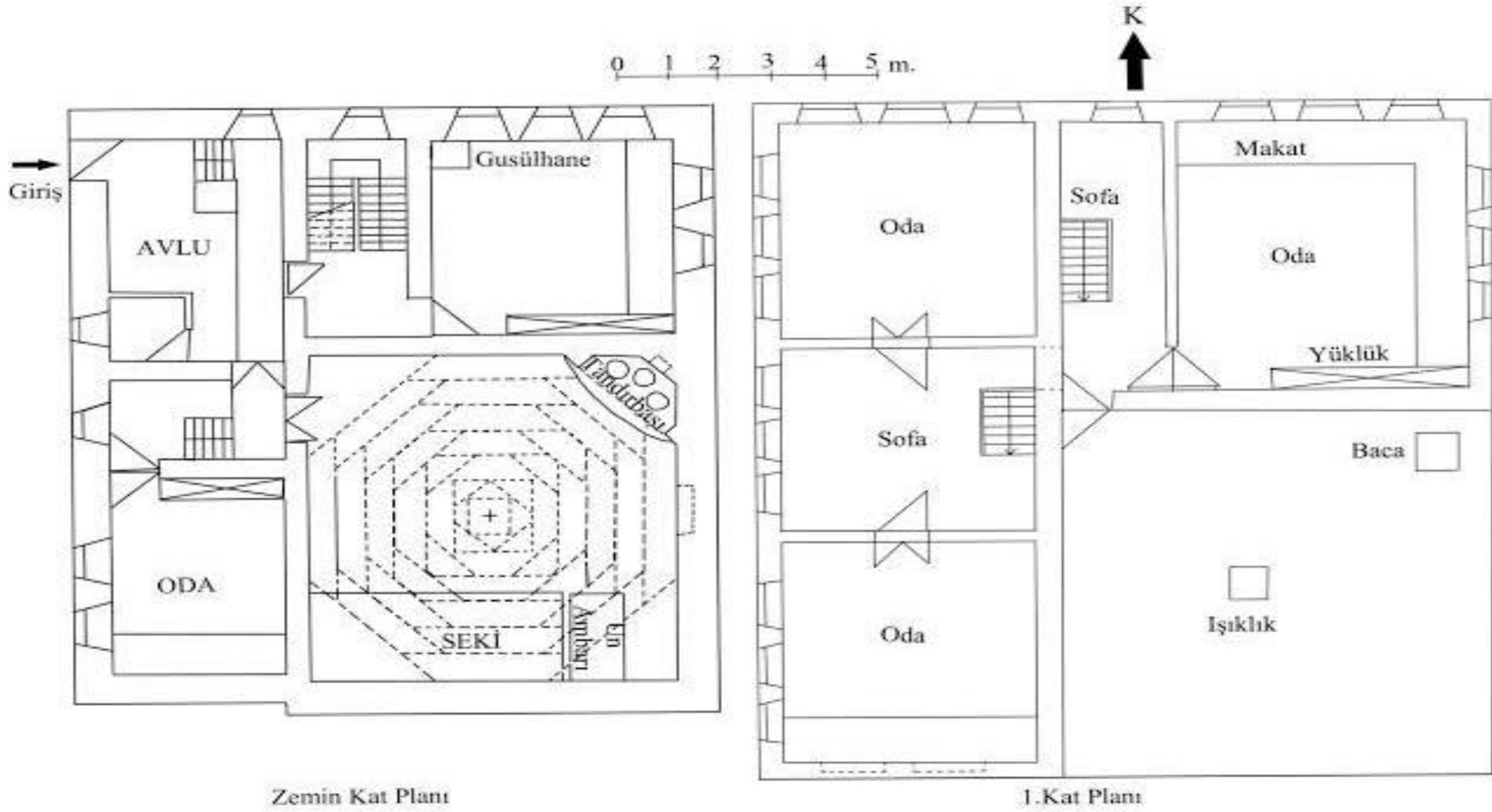


Windows

Metals; bronze and iron

Wood; pine, poplar, willow, and also reed and cane





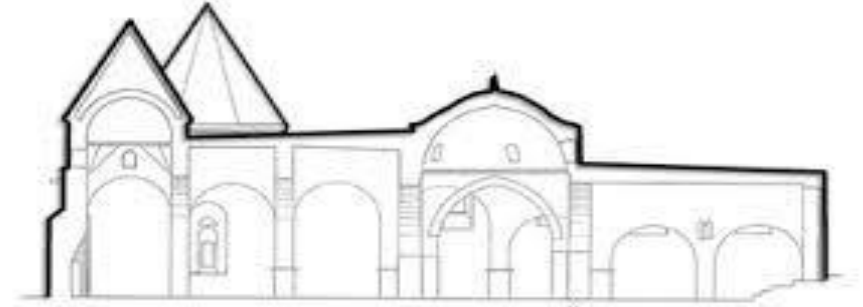
TANDIR EV PLANI



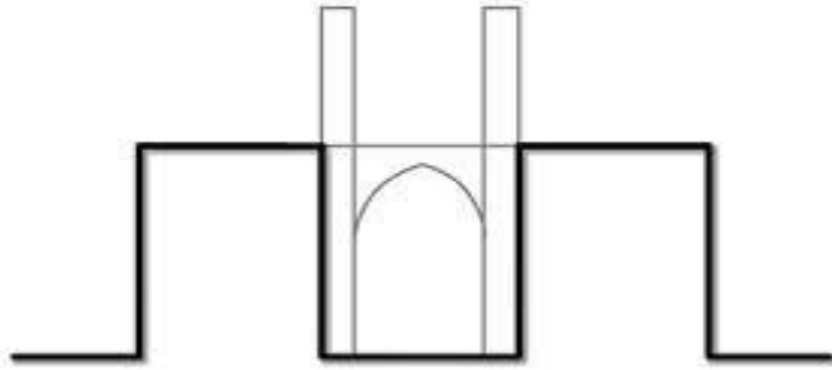
Erzurum Geleneksel Konut Örneği
(Atatürk Evi)



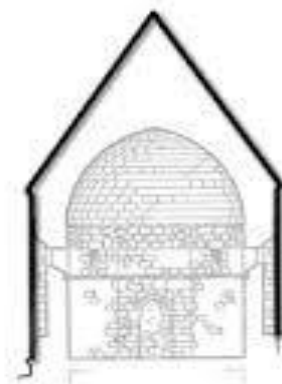
Erzurum Geleneksel Konut Örneği
(Kullebiler Evi)



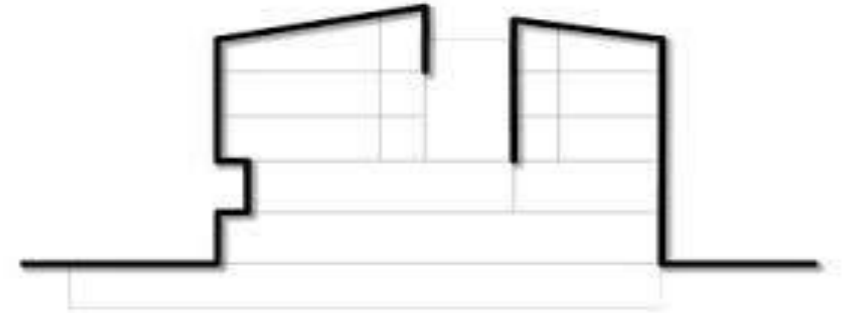
Selçuklu Kamusal Bina Örneği



Erzurum Çifte Minareli Medrese



Erzurum Çifte Minareli Medrese
Kümbeti



Tasarlanan yapı;

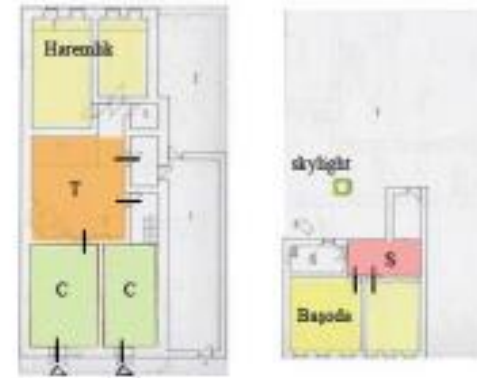
Dursun Akal House, 1754



1. Multi-part type

3.

2. North-South



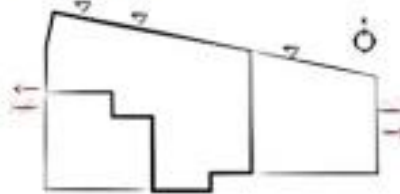
**Semih Bey's House,
end of 18th century**



1. Multi-part type

3.

2. East-West



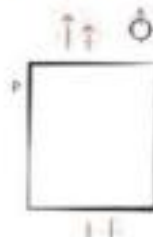
**Hanağasıgil House,
at the beginning of
19th century**



1. Two-storey

3.

2. North-South

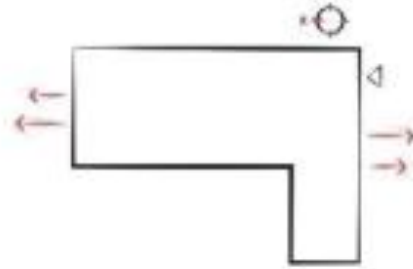


**Kobazagiller House,
mid-19th century**

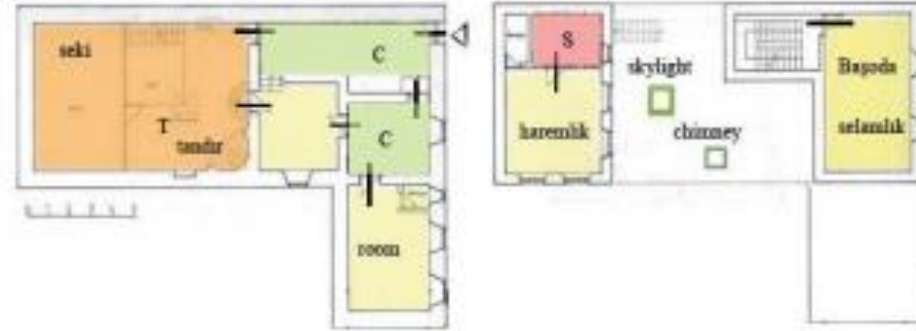


1. Two-storey

2. North-South



3.

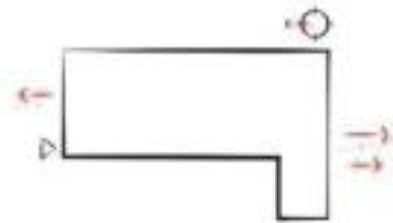


Ali Bayram House, 1890

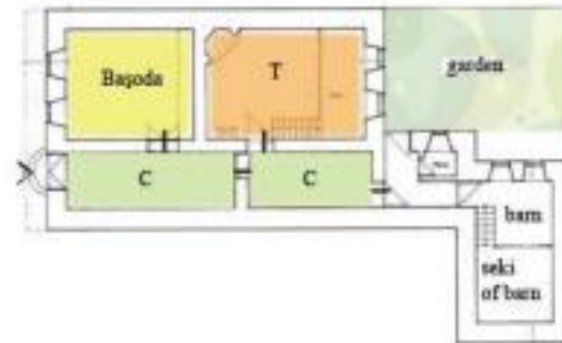


1. Single-storey

2. North-South



3.



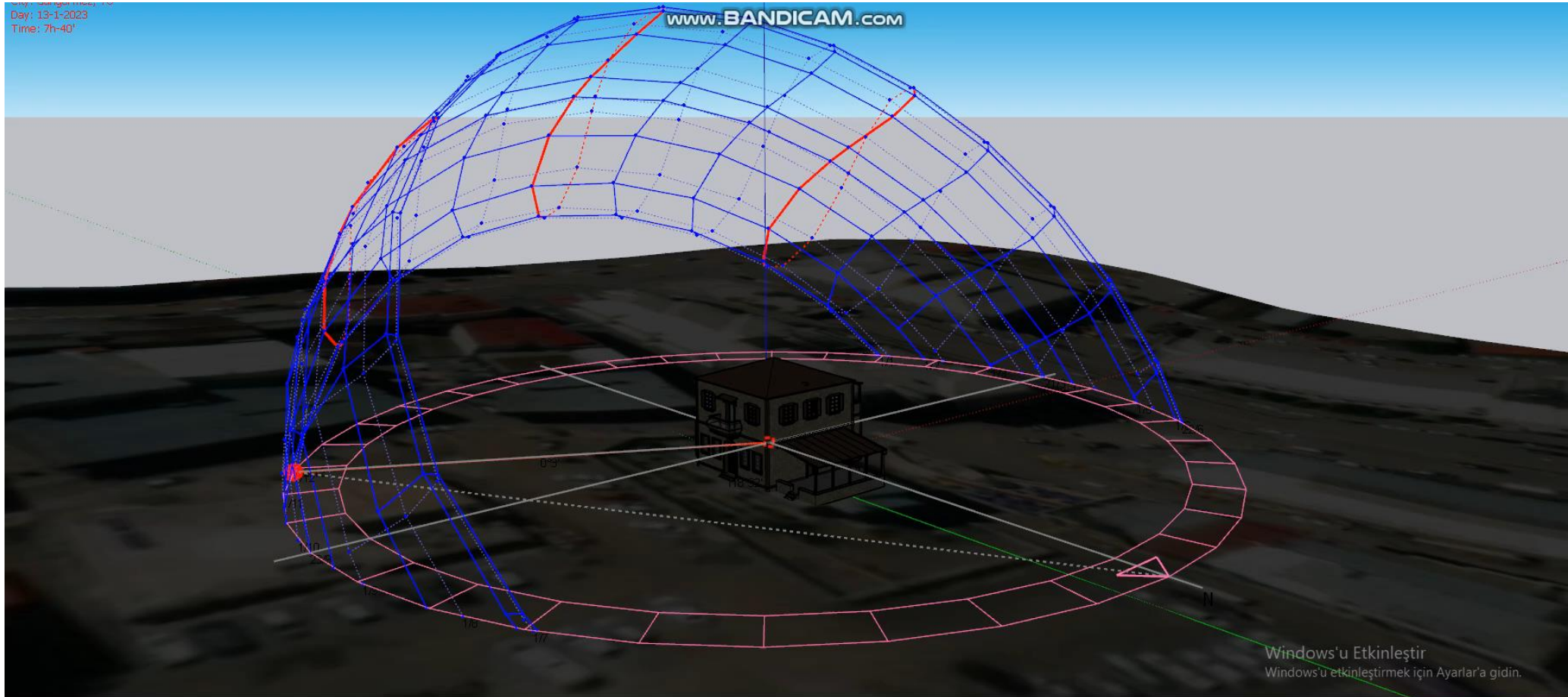
4.2. Suggestions



This proposal is just a suggestion to sustain and modernize vernacular architecture in the city with its advantages and cultural heritage.

In the design of the proposal, a new building is designed considering with the benefits of traditional examples against the problematic conditions of climate and geography, while the functions of the spaces are altered. The hostel is located in the north-south direction. From the thickness of the walls to the materials choice, and spatial layout, it is all designed to sustain thermal comfort by reducing the heat loss. The openings of the windows are larger on the inside than the outside in order get benefit from daylight more, and effect from the cold less. Moreover, fewer windows are placed on the western façades, while they are also smaller than the windows on the other façades to lessen the effect of the westerly wind. The most use areas in the building are placed on its east side as similar to the local examples. On the ground floor, the entrance of the building has inspired from the houses with two courtyards. This partial design helps the protection from the wind.

ERZURUM VERNACULAR HOUSE SUN PATH(EXTERIOR)



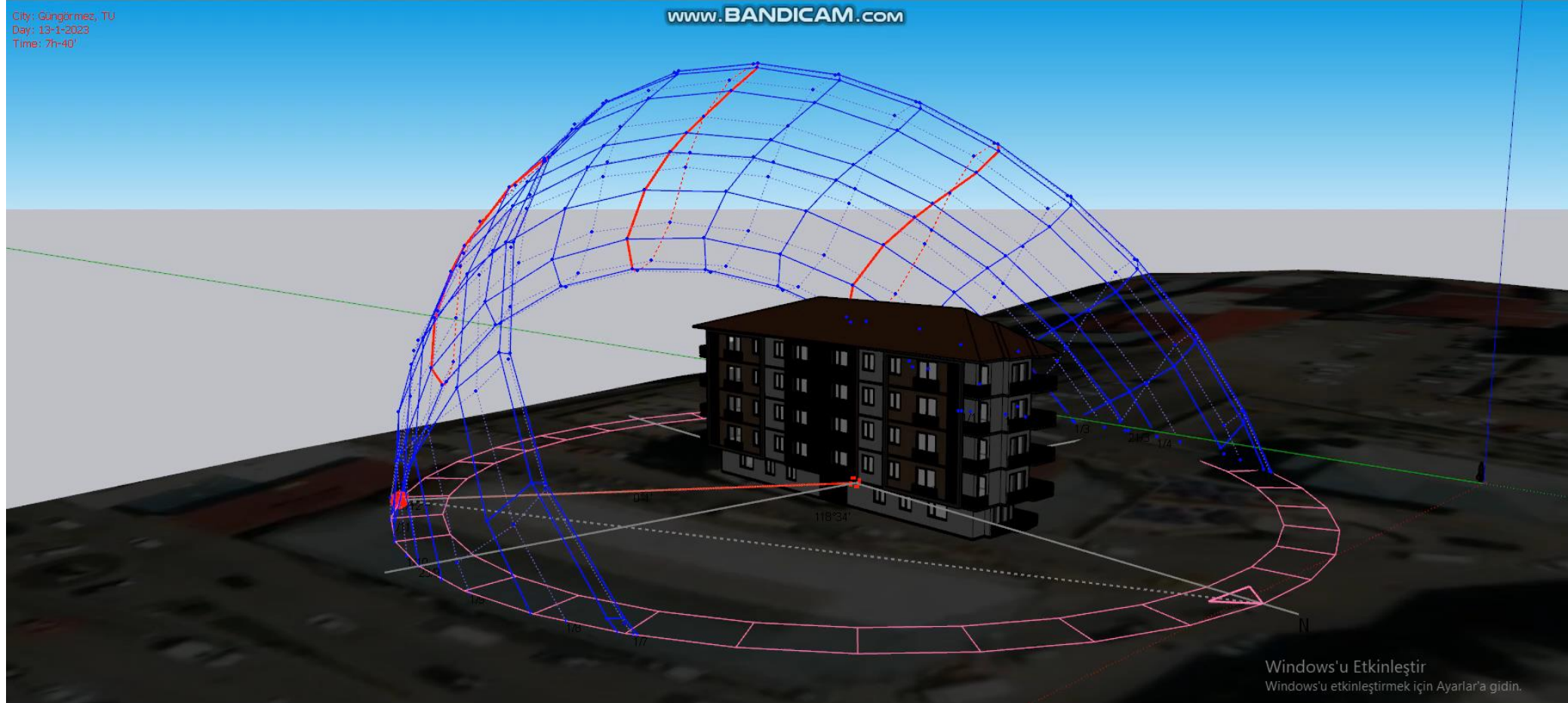
Yukarı Mumcu Mh., 25200 Yakutiye/Erzurum

ERZURUM VERNACULAR HOUSE SUN PATH(INTERIOR)



Yukarı Mumcu Mh., 25200 Yakutiye/Erzurum

ERZURUM MODERN BUILDING SUN PATH(EXTERIOR)



Yukarı Mumcu Mh., 25200 Yakutiye/Erzurum

ERZURUM MODERN BUILDING SUN PATH(EXTERIOR)



Yukarı Mumcu Mh., 25200 Yakutiye/Erzurum

REFERENCES

- https://www.izmir.bel.tr/icerikDetay-cografi_ozellikleri/1046/1.html#:~:text=Erzurum%20ili%20T%C3%BCrkiye'nin%20en,Senenin%20150%20g%C3%BCn%C3%BC%20karla%20%C3%B6rt%C3%BCl%C3%BCd%C3%BCr.
- <https://tr.wikipedia.org/wiki/Erzurum>
- <https://erzurum.ktb.gov.tr/TR-56063/cografya.html>
- <https://tr.climate-data.org/asya/tuerkiye/erzurum/erzurum-279/>
- https://www.meteoblue.com/tr/hava/historyclimate/climatemodelled/erzurum_t%C3%BCrkiye_315368
- <https://erzurumsevdasi.com/erzurum-evleri/>
- <https://erzurumca.com/erzurumun-geleneksel-ev-kulturu/>
- <https://erzm.konuanlatimi.net/tarihi-erzurum-evleri/>
- <https://www.trthaber.com/foto-galeri/asirlik-kultur-tarihi-erzurum-evleri/43391/sayfa-5.html>
- https://www.izmir.bel.tr/icerikDetay-cografi_ozellikleri/1046/1.html#:~:text=Erzurum%20ili%20T%C3%BCrkiye'nin%20en,Senenin%20150%20g%C3%BCn%C3%BC%20karla%20%C3%B6rt%C3%BCl%C3%BCd%C3%BCr.



ARTICLE SUMMARIES

ARTICLE: THE INVESTIGATION OF THE ERZURUM TRADITIONAL HOUSES FROM THE PERSPECTIVE OF CULTURAL GEOGRAPHY

VI- Conclusion and Recommendations Erzurum City is surrounded by mountains that present volcanic structures. As a result of this volcanic structure, people living in the region benefited from volcanic rocks, especially basalts, which are abundant in the environment, especially to meet their need for shelter. They built the houses by making use of these rocks both in their exterior and interior arrangements. The rocks known as karataş in the region and used as the main material in almost all traditional houses are basalts. Earthquake hazard is one of the most important problems for the dwellings built in Erzurum City. Even if some methods were developed and used during the construction of houses in order to minimize the impact of the earthquake, these were not sufficient and caused problems in the development of the city. Erzurum City is under the influence of a strong continental climate due to its physical geography features. It is seen that the temperature values decrease to -30, -35 °C in winter and these temperature values reach a high value of 171.8 days below 0 °C. In other words, frost is observed for approximately six months of the year. The average number of days covered with snow in Erzurum is 113.1 days. This is a very high value and covers a period of approximately four months. As a result of all these, human life is adversely affected and human activities are restricted. In the region, which has a cold climate, both the establishment place of the village settlements and the front facades and windows of the dwellings are shaped according to the sun and wind conditions. When evaluated from a cultural point of view, it is understood that Erzurum houses show parallelism with traditional Turkish house architecture in terms of basic principles and general character. However, due to its geographical location, it has unique features that are not seen in other regions except for the settlement areas around it. As the traces of Turkish house culture were observed during the construction of the dwellings, measures were taken against earthquakes and cold weather with various techniques developed to reduce the rate of being affected by physical geography conditions. In addition, while building the dwellings, it was tried to pay attention to the orders and prohibitions of the religion of Islam and additions were made in this direction. Although the traditional Erzurum houses show great similarities with the Turkish house plan types in general, especially the tandoori and some other local elements separate the Erzurum houses from the other regions of Anatolia. For example, various elements such as tandirevi, tandırbaşı, gargoyles, hatil, kherz, karlangus-sweater-tereklikli cover, cloakroom, sergen or terek are known and used in Erzurum City and its surroundings. It is thought that it is correct to evaluate the traditional Erzurum houses separately as cultural productions that should definitely be preserved due to such characteristics. By restoring the standing traditional Erzurum houses, both our cultural assets should be protected and these houses should be included in cultural tourism resources. Traditional Erzurum houses should be evaluated and it should be ensured that Erzurum City is an important cultural tourism center, as in the cities of Safranbolu, Mardin and Amasya. The makeshift buildings built around the traditional Erzurum houses, which have managed to survive today, should be removed. Houses, which are one of the most important elements of historical cultural heritage, should be discovered and protected.

LEARNING FROM VERNACULAR ARCHITECTURE: ECOLOGICAL SOLUTIONS IN TRADITIONAL ERZURUM HOUSES

Over the years, local architecture has suggested the effective use of natural resources and conscious choices. In relation to the regional environment of materials and construction techniques. Likewise, with the use of With local materials, different spatial organization and ingenious construction systems, traditional Erzurum houses offer ecological solutions suitable for geographical and climatic conditions. On the contrary, local In today's city of Erzurum, where the number of traditional dwellings has increased, architecture is about to disappear. is decreasing day by day. In the first years of the Turkish Republic, in the 1930s, there were close to 3,000 traditional houses. in the town, however, only 33 houses remained in 2003. And only a few of them are in ruins, tucked in the middle of newly rising apartments. unplanned urbanization Local architectural examples, of course, represent the period in which they were built. today's modern Houses Contrary to the old Turkish culture living with grandparents, a family mostly lives in the house. and a few relatives. However, as in the examples mentioned above, Erzurum houses contain important clues for new structures. new Houses can be designed according to the benefits of traditional houses by providing sustainable features. features. They can be modernized according to the needs and requirements of the era. Concrete blocks are the products of consumerism that serves material benefit rather than welfare. of its inhabitants. The new concrete blocks are contrary to the city's climate and nature, and at the same time incompatible. with culture and social life. Therefore, the city is about to lose its identity when new structures are not made. sustaining ecological solutions where traditional buildings have already succeeded. In other words, passive and economical systems gave way to active systems and more and more energy consumption for heating. and cooling. This problem does not only belong to Erzurum, it is Turkey's problem, in fact. While cities lose their identities with similar blocks, increasing standard constructions Apartments prevent people from living in thermal comfort. On the other hand, local architecture has several features. advantages.

COMPARISON OF GEOMORPHOLOGY IN ANTAKYA AND ERZURUM URBAN ECOLOGY

In general, it has been understood that some of the problems arising from the geomorphological features of the study areas, one located in the south and the other in the east of Turkey, are similar. These similar problems are mass movements and earthquakes. The reason for the existence of similar problems in both cities is actually geomorphological conditions. As a matter of fact, the city of Antakya is bordered by the Habibineccar Mountain and Erzurum by the Palandöken Mountains. In addition, both cities have an expansion potential towards the plain. In this context, Antakya is growing towards the Amik Plain and Erzurum is towards the Erzurum Plain. The location of the cities in relation to the mountain increases the risk of mass movements, and their growth towards the plain increases the risk of earthquakes. On the other hand, due to the location of Antakya relative to the river, there is also a flood and overflow risk. The main reason why such problems are not seen in the city of Erzurum is that there is no big river flowing around the city. From the point of view of urban development, since the development directions of both cities are different, the problems they currently face are changing, and the problems they will face in the future are predicted to diverge. The development, which has been especially appreciated recently, has been experienced towards geomorphologically problematic areas. However, it is more correct that the areas to be developed in the near future in the city of Antakya are plateau areas with suitable geomorphological characteristics, since it allows them to take place on more resistant soils against earthquake effects. This situation is also a suitable development in terms of urban ecology. Although the city of Erzurum was first established around a low hill, it later expanded towards the Erzurum Plain. Today and in the near future, the areas that will be opened for development are the plains, which have an inappropriate geomorphological quality and are less resistant to earthquake effects. This is erroneous growth and a negative development in terms of urban ecology.

STATISTICAL DATA ANALYSIS OF TRADITIONAL ERZURUM HOUSES

The traditional Erzurum House has emerged as a result of the tent structure, which the Turks know very well in their homeland, enriching it with the architectural accumulation of the geography they migrated to, to Anatolia where different civilizations live together. Erzurum houses, which create a very rich architectural texture by combining Turkish house construction principles, design and architectural features, construction experiences with historical background, and local elements, were built in harmony with the physical conditions of the place they are located. In addition to the physical conditions, another important factor affecting Erzurum houses, as in the traditional Turkish houses, is the culture of life. The style of life in these houses is determined by the volumes put forward during the design phase of the house. Until the beginning of the 20th century, the design of the houses in the form of dividing harem-selamlık is the most important volume that affects the life of the house. The most important determinant of life in Erzurum houses is the tandoori houses located in the harem section. The tandoori, where a large part of daily life takes place, has structural elements to meet all of the vital activities. In addition, harsh winter conditions forced the ground floor of the Erzurum house to be used for winter and the upper floor to be used as a summer residence. Until the first half of the 20th century, the barn and mare units in the gardens of the houses with gardens and detached ones are planned. It has been done. The multifunctional structure of the Erzurum house, which consists of different units, reflects the self-sufficiency characteristic we observe in the Turkish House tradition in Anatolia. In the Erzurum house, the courtyard and the sofa, unlike other regions, were reduced to size and used as transitional spaces. The function assigned to the courtyards and sofas of other regions is met by a tandoori house in Erzurum house. An important part of the cultural heritage; It consists of traditional houses that are of local, national and universal importance and should be preserved and transferred to the future. It is known that traditional houses are worn out and gradually disappear in long-term use due to various reasons such as lack of maintenance and repair. Many researches on traditional houses from past to present show that houses are deteriorated due to various reasons that can be gathered under physical and functional headings. Physical aging process is the deterioration of the original building elements and materials of the traditional house due to various factors, the functional aging process is the expression of the house's inability to respond to current needs. The social, cultural, economic dynamics, legal and institutional structure of the society in which the house is located is also significantly effective in the preservation and adaptation of the traditional house to the present and its transfer to the future.

AN EVALUATION ON THE ARCHITECTURAL FEATURES AND CONSERVATION OF TRADITIONAL ERZURUM HOUSES

Traditional Erzurum houses are a cultural heritage that goes beyond the Turkish house plan type and has completely unique characteristics due to its harsh geography. The tandoori culture, which brought the family together instead of the sofa, also affected the plans of the houses. The ceiling cover "Swallow cover", which is especially used in the tandoori, is one of the most important techniques that differentiates the architecture. However, many different construction techniques and architectural features that increase the value of these houses cannot be ignored. However, many of these structures, especially from the 19th century, have been demolished or become unusable, since not much effort has been made in the past years to bring them to the present day. It is very important to register and protect the traditional Erzurum houses, which have survived to the present day and are very few in number. Bringing these houses into tourism as a museum, restaurant or accommodation business will both ensure the sustainability of the culture and contribute to the city economically. One of the first places visited by all domestic and foreign tourists coming to Erzurum is a tourism business called Erzurum houses. This business was founded by an entrepreneur as a result of the repair and restoration of seven traditional 340-year-old Erzurum houses. This establishment, which contributes greatly to the positive image of the city, receives many domestic and foreign visitors every day. In this way, besides being a source of livelihood for the people, it also plays a major role in the preservation of traditional houses. It is very important to transfer the Erzurum houses that have survived to the present day, albeit in small numbers, to future generations, in order not to lose the cultural values of the society. For this reason, it is necessary to inform and raise awareness of the local people about preserving their historical identity.