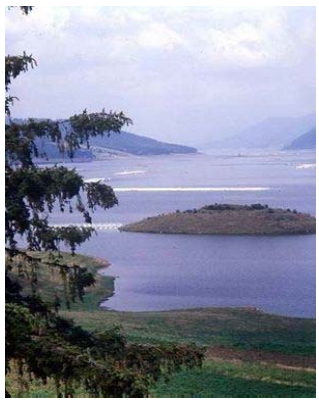
# *2. COUNTRIES OVERVIEW (CLIMATE AND GEOGRAPHY)*

## *2.1. Bulgaria*


### *2.1.1. Bulgaria – geography*

The Republic of Bulgaria is located in the southeastern part of Europe in the Balkan Peninsula. The country borders on Turkey and Greece to the south, Former Yugoslav Republic of Macedonia and Serbia to the west, Romania to the north and the Black Sea to the east. The total area of the country is 111 000 km².

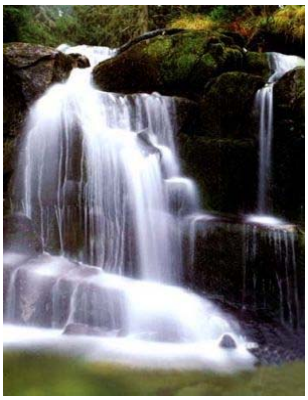


The relief of Bulgaria is extremely varied. Vast plains and valleys, precipitous ravines and gorges, lowlands and high mountains alternate together on its comparatively small territory. The average altitude above sea level is 470m. The Balkan Range (Stara Planina) stretches across the country from the Belogradchic Pass in the west to the Emine Cape in the east dividing it into two halves.

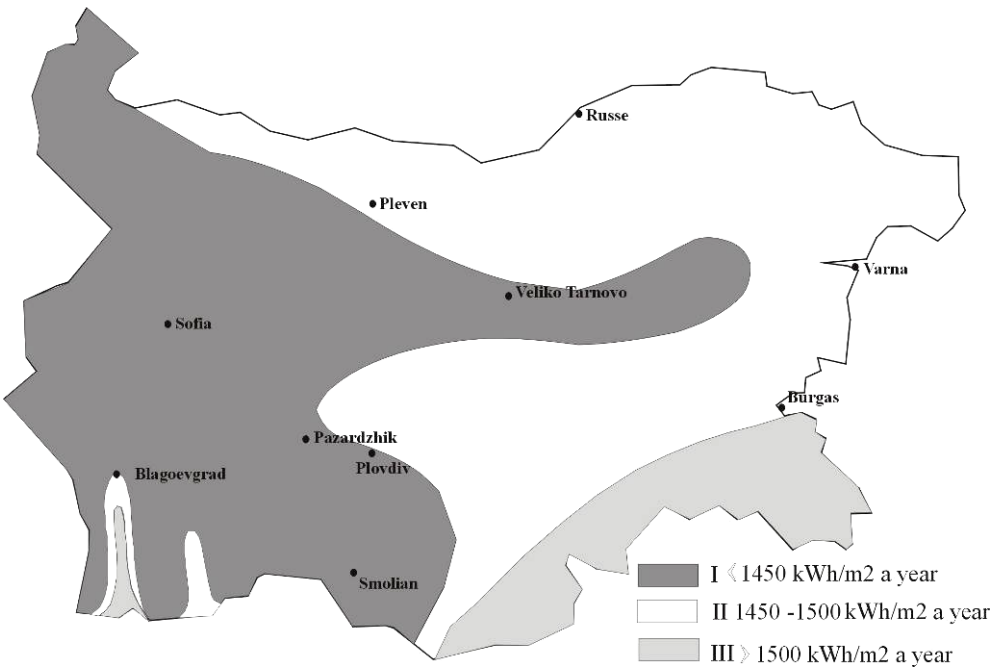
The Rila Mountains are the highest in Bulgaria as well as in the whole Balkan Peninsula with Mt. Moussala – 2925m, followed by the Pirin Mountains with Mt. Vihren – 2915m. To the east of Pirin is the largest mountain massif on the peninsula – the Rhodopes. The Sredna Gora Mountains run parallel to the Balkan Range, between them is the Valley of Roses. The Danubian plain is situated between the Danube River and the Balkan Range. The Thrace lowland spreads to the south of the Balkan Range.

### *2.1.2. Bulgaria - climate*

The climate is temperate with four distinctive seasons and varies with altitude and location. The climate in Northern Bulgaria is moderate continental, while the climate in Southern Bulgaria is intermediate continental tending to Mediterranean. The climate in the regions with an altitude of 1900 – 2000m above sea level is mountainous and along the Black Sea cost is maritime. The Black Sea coast features a milder winter as opposed to the harsher winter conditions in the central north plains.



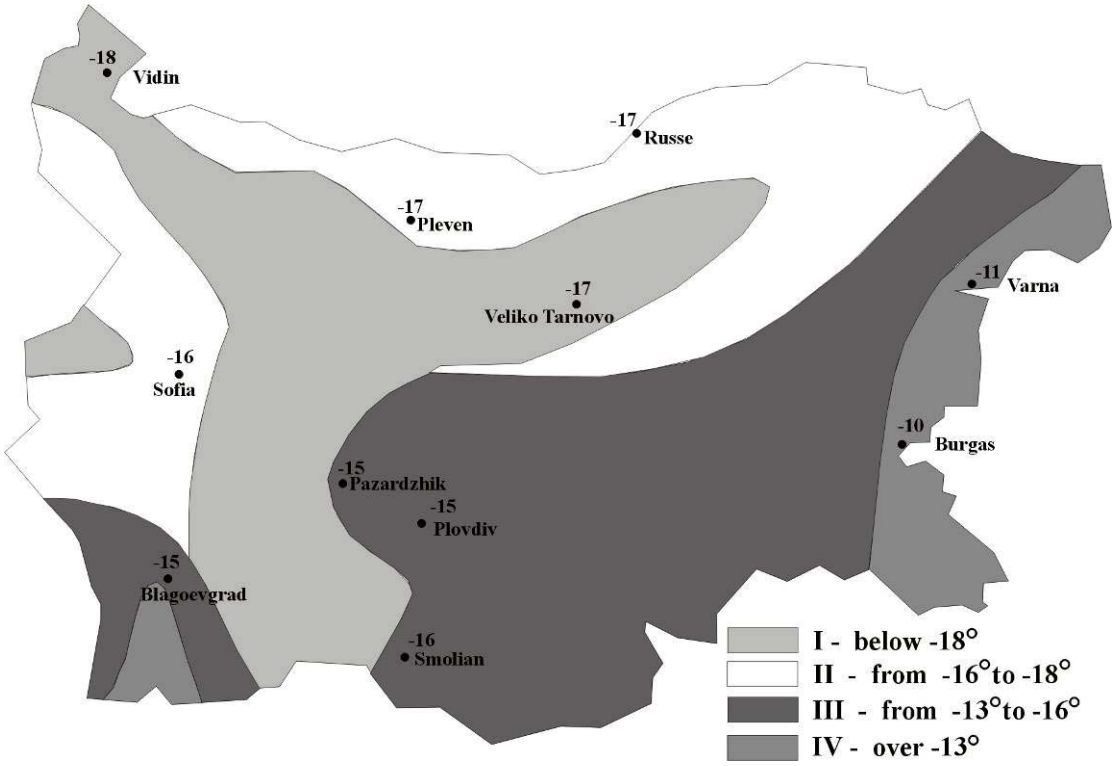
In Bulgaria the average annual period of sunshine is about 2 100 hours, in some of its regions it may reach 2 500 hours (i.e. the range is from 1 410 to 1 600 kWh/m² annually)




*Solar energy zones in Bulgaria; annual distribution of total solar radiation.*

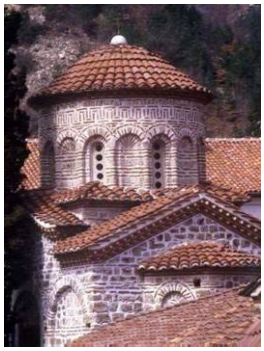
The air temperature characteristic of the climate is a result of the solar radiation intensity and depends on the amount of thermal energy, radiated from the surface of the earth during its 24-hour and annual cycles. Air temperature affects the thermal conditions of the surrounding structures and (by its extreme and average values) the adjustment of the heating and air-conditioning systems in buildings, as well as the solar energy heating systems.

Thus, for instance, the capacity of heating systems depends on the calculated temperatures for the respective region (N.B. the lowest winter temperatures). Temperatures are also decisive when one has to determine the respective thermal insulation requirements of particular buildings. The following figure presents a map of Bulgaria showing 4 zones of different minimal temperatures. It does not identify, however, regions with specific climatic conditions, or mountainous regions with altitude more than 1000m




*Calculated temperature in °C – zoning according to minimal temperatures.*

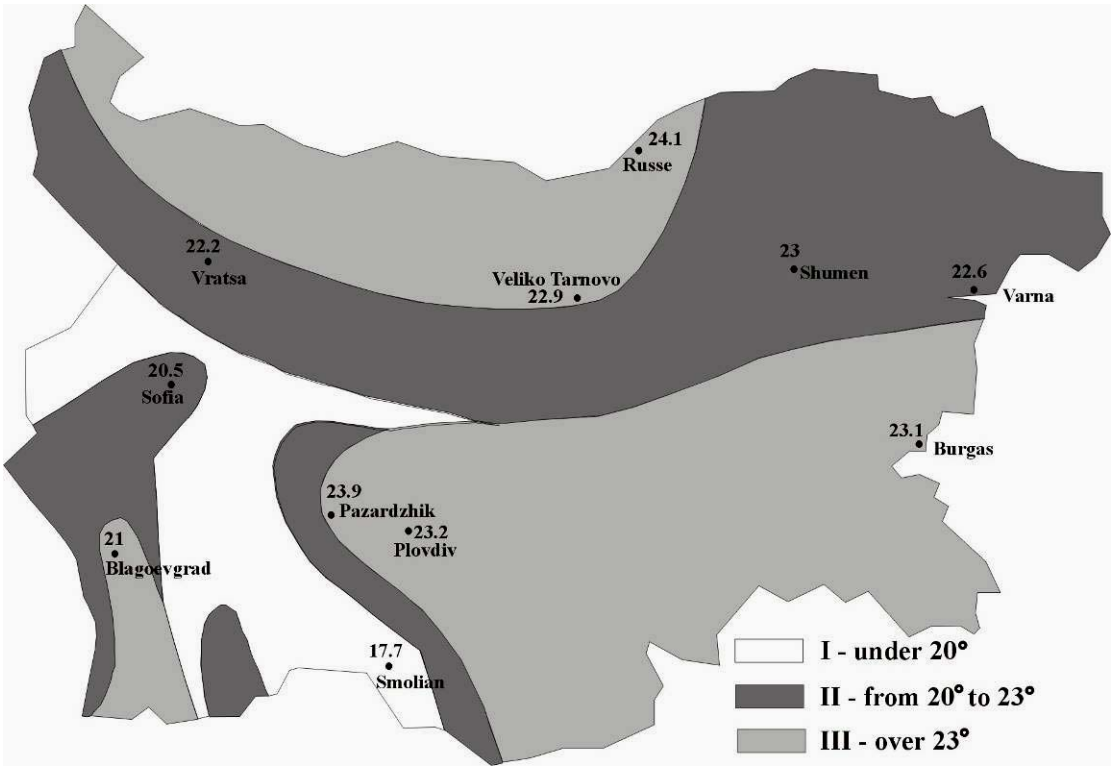
Significant for solar systems is not the highest temperatures, but the average summer temperatures. The following map shows the territorial distribution of the average 24-hour summer temperatures in Bulgaria.



*culture*

*tradition*

*sustainability*




*Average summer temperatures per 24 hours – territorial distribution.*

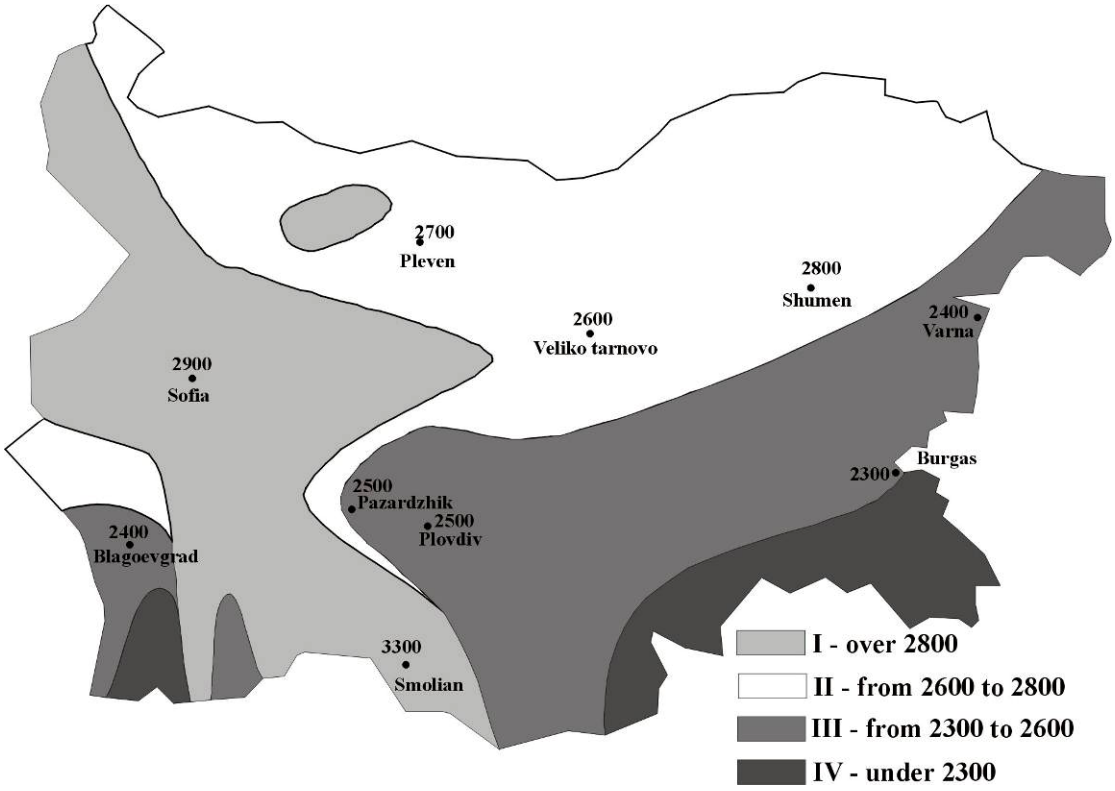
The average annual temperature is 10,5 °C, in winter about 0 °C. The lowest temperature –38,3 °C was measured in 1947. The average monthly temperatures for the capital city Sofia range from –3,7°C in December to 28,2°C in August. The duration of the heating season varies between 160 and 220 days for the different locations.

Table 1 presents the average monthly temperatures for various Bulgarian cities, situated in the north, the west, the south and the east part of Bulgaria.

***Table1 Average monthly temperature, °C (1998)***

| Month / Town | Pleven | Sofia | Pazardzhik | Varna |
|---|---|---|---|---|
| January | 2.5 | 1.5 | 2.5 | 4.1 |
| February | 5.3 | 8 | 4.4 | 4.2 |
| March | 4.8 | 2.9 | 4.7 | 4.9 |
| April | 14.7 | 13.1 | 14.3 | 13.2 |
| May | 16.9 | 14.7 | 17.0 | 15.8 |
| June | 22.4 | 20.0 | 21.9 | 21.1 |
| July | 24.1 | 22.2 | 24.2 | 22.7 |
| August | 24.5 | 22.1 | 23.7 | 23.8 |
| September | 16.7 | 15.1 | 16.9 | 17.8 |
| October | 12.8 | 11.6 | 12.9 | 14.4 |
| November | 3.5 | 3.7 | 5.3 | 6.8 |
| December | -3.1 | -3.7 | -0.9 | 0.8 |
| **Average annual value** | **12.1** | **10.6** | **12.2** | **12.5** |

An important indicator describing the duration of the heating season and roughly the energy requirements for heating is the number of the degree days. The number of the degree days is defined by the product of the difference between the outdoor temperature and the required indoor temperature and the number of days during which this difference must be maintained. For example, if the average outdoor temperature in January is -3°C for a certain location and the required temperature inside premises is 18°C, then the number of degree days for January is 21 degrees x 31 days = 651 degree days. Accordingly, the heating degree days for indoor temperatures of 20°C vary between 2100 and 3500 for different regions in Bulgaria. For Sofia these are 2500 on average. The following figure presents a country map on which 4 characteristic zones are delineated according to the level of their degree-days.




*Heating degree-days – 4 characteristic zones.*

The average wind speed is 1,2m/s (1,3m/s in winter time), while prevailing winds are west or northeast.