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EXTREME TEMPERATURES AND THEIR EFFECTS ON THE HUMAN BODY

Doina Capşa[1], Valentin Nedeff[2], Maria Vasilică[3], Lazăr Gabriel[4], Panainte Mirela[5], Bârsan Narcis[6]

Key words: air temperature, temperature humidity index, index of cooling, hot weather.

Abstract. The air temperature presents a periodic variation (diurnal and seasonal) and a non-scheduled one due to the atmospheric disturbances. The extreme values of the temperatures recorded in the warm and cold season cause biological disturbances in the human body and they require adaptation to the changes of rhythm and of thermal comfort. The temperature correlation with the air moisture in the warm season, as well as in the cold one with the wind speed, is achieved by the temperature humidity index (THI) and the cooling index (IR).
This paper outlines the general aspects in Romania related to temperature, temperature humidity index, the hot weather and cooling index, combined with the effects produced by these general aspects on the human body. Also, the study analyzed the above mentioned issues in the region of Moldova from 2006 to 2007.

Introduction

80 % of the solar radiation is absorbed by the Earth's surface. Therefore, the soil surface warms and it transmits warmth to the air layers above it and to the deep soil layers. The transmission of the heat into the soil is mainly made through the conduction phenomenon, whereas that to the atmosphere is made by convection and radiation. The land area is an active area (Apostol 2004, NMA 2008).

The air temperature is the most important climatic factor in the pathogenic action on the human body, because its value and its variability determine physiological reactions that stimulate or, conversely, reduce the exercise capacity

[1] Meteor. PhD., Regional Weather Forecasting Service Bacau
[2] PhD., Regional Weather Forecasting Service Bacau
[3] PhD. Student, Regional Weather Forecasting Service Bacau
[4] PhD. Student, Regional Weather Forecasting Service Bacau
[5] PhD. Student, Regional Weather Forecasting Service Bacau
[6] PhD. Student, Regional Weather Forecasting Service Bacau

of the human body and, in addition, provide favorable conditions for the development of pathogens (Ion Bordei and Taulescu 2008).

Normally, the human body is endowed with its own thermal control system, which allows it to have a constant internal temperature (37 ± 0.5 °C), allowing it to perform motive activities independent of the ambient temperature (homeothermia) (NMA 2007).

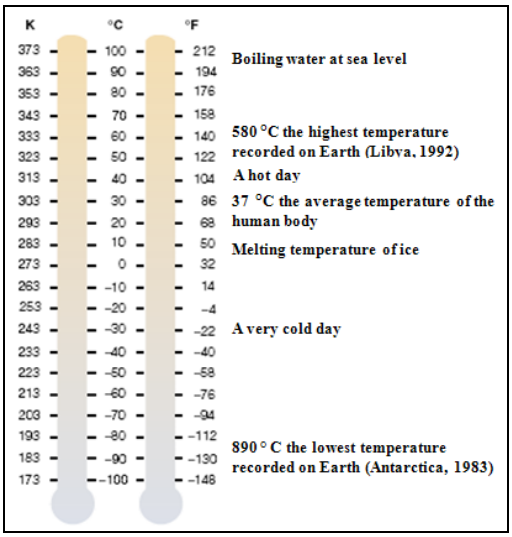

Fig.1 - Representation of the relation between the temperature scales (Howell 1993)

Theoretically, the lowest temperature possible, called absolute zero is the temperature at which any movement of atoms and molecules stops. This temperature marks the zero value of the Kelvin scale, named after the man who introduced it, Lord Kelvin (1824-1907). It is called the absolute temperature scale and it is used for scientific calculations, having the advantage that all its values are positive. The intervals of the Kelvin scale are equal to the intervals of the Celsius scale. The Celsius scale began to be used in the late eighth century, being defined for simple practical considerations: the temperature of zero degrees is the temperature at which water freezes at normal pressure and the temperature of 100 degrees is the temperature at which the water boils at normal pressure. The relation between the temperature expressed in Kelvin and in Celsius degrees is expressed by the simplified relation T (K) = t (°C) + 273.15. Another scale of temperature is the Fahrenheit scale and it is used today especially in the United States. The relationship between the Fahrenheit scale and the Celsius scale is given by the relation (NMA 2007, NMA 2008):

$$t(^{\circ}C) = \frac{5}{9} \cdot \left[t(^{\circ}F) - 32 \right] \quad (1)$$

In Figure 1, the correspondence between the three scales, for the most used domain, is represented.

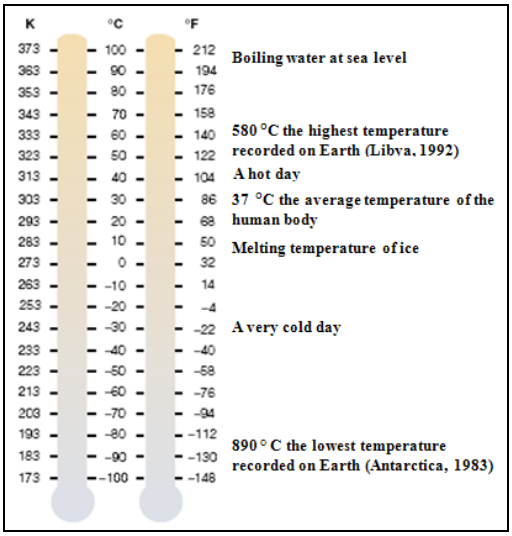

Fig.1 - Representation of the relation between the temperature scales (Howell 1993)

2. Temperature variation factors

The most important variation factors of the temperature are: the latitude, the distribution of the soil and of the water, the ocean currents, and the altitude.

The world average annual temperature is of 14.3 °C. On the hemispheres: in the North it is of 15.2 °C and in the South of 13.3 °C. The maximum average values are found along the parallel of 10 °N (called the thermal equator). At the summer solstice of the Northern hemisphere, the thermal equator is at 20 °N (NMA 2007, NMA 2008).

In summer, the northern hemisphere is warmer than the southern hemisphere with 1.6 °C because the land area is bigger. In winter, the northern hemisphere is colder than the southern hemisphere, for the same reasons (NMA 2007, NMA 2008).

The western part of the oceans is warmer than their eastern part (we talk about the air temperature), due to the warm currents.

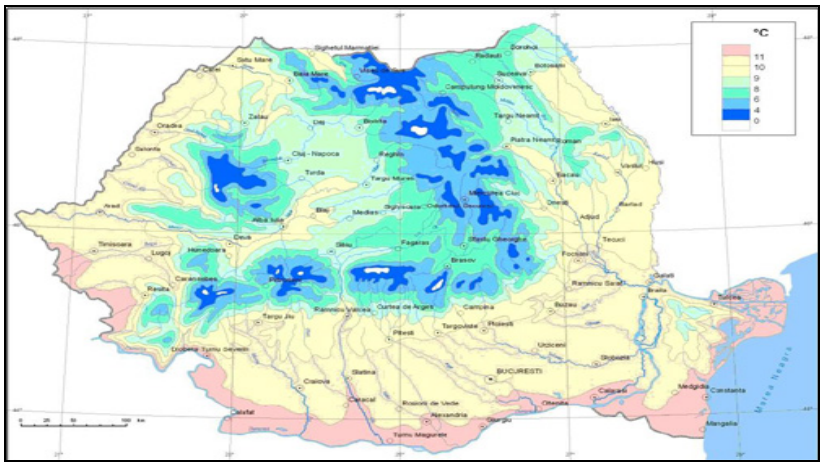

Fig. 2 - Average annual temperatures in Romania.

In our country, the influence of the latitude is not so relevant. In general, the southern zone is warmer, but this is due to the relief, mostly flat. As we can see in Figure 2, the relief has a significant influence on the average temperatures (altitude). The presence of the Black Sea influences enough the temperatures of the coastal area, the influence being observed according to the season, in summer the temperatures are lower and in winter they are higher. At the level of a year, the variations are no longer significant (NMA 2007, NMA 2008).

Temperature has two types of variations: daily and annual. Daily variation is characterized by a maximum around 14^{00} and a minimum before sunrise. The difference between maximum and minimum temperature is called diurnal amplitude. The highest values of the diurnal amplitude are recorded in the tropical deserts, 35 to 40 °C. The lowest value of the amplitude is recorded in the polar area, 3 °C. On the surface of the oceans, these variations are smaller, 20 to 25 °C at the tropics and almost none (1 °C) in the polar areas (NMA 2008 www.meteoromania.ro).

The annual variation is characterized by a maximum in July and a minimum in January (Northern hemisphere). Above the ocean basins, the maximum is in August, while the minimum is in February. The difference between the averages of the hottest and of the coldest month is called annual amplitude. This amplitude varies according to the latitude of the place, the duration of day and night, the nature of the land surface and vegetation coverage. The highest annual amplitude is recorded in the polar area, about 65 °C on land and 40 °C in the coastal areas. The minimum value of the amplitude is at the equator, 4 to 5 ˚C to dry and 1 ÷ 2 °C on

the coast. At the Equator, the day is equal to the night, and there is only one season (NMA 2008, www.meteoromania.ro.).

In terms of annual variations, there are four types of annual (variations) gait (Bordei and Taulescu 2008, NMA 2008,):

- The equatorial type - two peaks after equinoxes and two minimums after the solstices, with amplitudes of 1 ÷ 7 °C;
- The tropical type - a maximum after the summer solstice and a minimum after the winter solstice, with magnitudes of 5 to 20 °C;
- The subtropical type - with a period of four months with high temperatures and rainfall and eight months of drought and amplitude values above 30 °C;
- The type of temperate-polar zone - a maximum in summer and a minimum in winter, with big differences of temperature from West to East. The amplitude varies from 10 to 50 °C.

The outside air temperature represents the degree of heating of the atmospheric air.

The extreme high temperatures are the outside temperatures of the air that exceed 37 °C, or they are correlated with conditions of high humidity and they can be equated to this level.

The high equivalent temperature is the outside temperature of the air, correlated with the relative humidity and it is expressed by a derived quantity, namely the temperature-humidity index.

The extreme low temperatures are considered the temperatures below -20 °C or when the cooling index falls below the threshold of - 32 °C.

The low equivalent temperature is the outside air temperature correlated with the wind speed and it is characterized by a derived size, respectively the index of cooling.

These temperatures are monitored and certified by the National Meteorological Administration and they are transmitted to its regional centers, according to the color codes. In Table 1, the color codes and the extreme temperatures corresponding to our country are specified.

The Emergency Ordinance no. 99 of 29 June 2000 provides measures that can be applied during the periods of extreme temperatures to protect the employed persons (NMA 2012).

The National Meteorological Administration has to communicate, by means of mass communication, the areas where the temperature, respectively the temperature-humidity index or the index of cooling, reaches the critical thresholds.

The regional meteorological centers will communicate to the county commissions of defense against disasters of the territory they monitor, the temperature values, namely the temperature-humidity index or the index of

cooling, the warnings on the evolution of these parameters in the next 48 hours and the areas in which these parameters are recorded.

Tab. 1 - Warning thresholds for extreme temperatures at altitudes lower than 800m (NMA 2012).

Code	Extreme maximum temperatures	Extreme minimum temperatures
Yellow code	The maximum temperature of the air is included in the range 37-39 °C. It will be issued only if the temperature will have values that will fit the thresholds, for at least two consecutive days.	Yellow code: The air temperature is included between -25 and -27 °C. It will be issued only if the temperature will have values that will fit in the thresholds, for at least two consecutive days.
Orange code	The maximum temperature of the air is included in the range 40 - 42.9 °C. It will be issued also if after two consecutive days of yellow code, the temperature rises just for a day to the threshold values.	The air temperature below -25 °C (altitude < 800 m). It will be issued also if after two consecutive days of yellow code, the temperature falls one day below -25 °C.
Red code	The maximum air temperature > 43 °C. It will be issued also if after two consecutive days of orange code, the temperature rises just for a day to the threshold values.	No standard criteria. The decisions are taken according to the situation.

The National Meteorological Administration must communicate to the central stations of radio and television and to the central bodies of the public administration the values of the temperatures, respectively the temperature-humidity index or the index of cooling, and the warnings on their evolution in the next 48 hours, at the national level. The transmission of the mentioned data and information will be made every 6 hours throughout the period, starting from the first warning of reaching extreme values of the parameters and up to a return to a normal temperature (NMA 2012).

2.1. The thermal comfort index (temperature-humidity index) (THI). The thermal comfort can be defined as a narrow zone in which the human body does not lose heat and does not receive it (NMA 2012).

By establishing the thermal comfort index, the air temperature is corroborated with the relative humidity in order to determine an apparent temperature (that felt by the body). Normally, the body cools by sweating, a process during which the water evaporates and therefore, the retained heat

diminishes. When relative humidity is high, the water evaporation rate is reduced, the body cools more slowly and it retains more heat. In order to remove the excess of thermal energy, it is necessary that in the environment T < 37 °C (the body temperature); otherwise, the body might overheat, the internal temperature would rise and at over 42 °C, all the proteins inside the human body would coagulate and finally the death would occur by thermal shock.

The temperature-humidity index (THI) is calculated according to the following relation:

$$\boxed{THI = (T \cdot 1,8 + 32) - (0,55 - 0,0055 \cdot H) \cdot \left[(T \cdot 1,8 + 32) - 58 \right]} \quad (2)$$

In which: T is the air temperature at 2 m (°C) and H is the air humidity at 2 m (%). The formula recommended by OMM used in the SIMIN software is:

$$\boxed{THI = 0,81 \cdot T + 0,01 \cdot H_r \cdot (0,99 \cdot T - 14,3) + 46,3} \quad (3)$$

In which H_r is the relative humidity of the air at 2 m (%).

The critical threshold for the thermal comfort index is 80. For values equal or bigger than the critical threshold, people must protect themselves adequately.

3. Results and discussion

For a detailed analysis of the extreme temperatures effects on the human body, we must identify the meteorological aspects related to the variation of the temperature- humidity index value.

3.1. The hot weather in Romania in 2007. The year 2007 was the warmest in the last 107 years in Romania. It began with a warm winter (the warmest of the last 107 years) in which the absolute records of the daily maximum temperature were exceeded (24 meteorological stations) (NMA 2007, www.wetterzentrale.de).

The summer of 2007 was comparable to that of 1946, but with a bigger persistence of the hot days (Tmax > 35 °C), the absolute maximum temperature was exceeded in the country in July (44 ºC on July 24 at Calafat), the monthly absolute maximum temperature was exceeded, in June (53 stations), in July (94 stations), in August (17 stations), a record number of daily maximum temperatures > 40 °C (148 cases), a record number of hot consecutive days - in July: 10 days at Calarasi, Bucharest-Filaret, Drobeta Turnu Severin (Fig. 3).

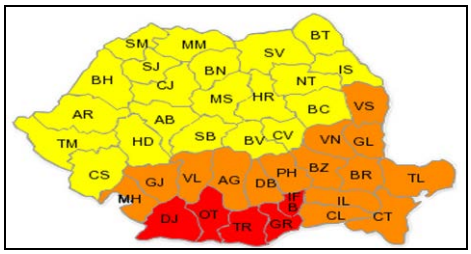

Fig. 3 - Graphical representation of the evolution of the THI value in August 2007.

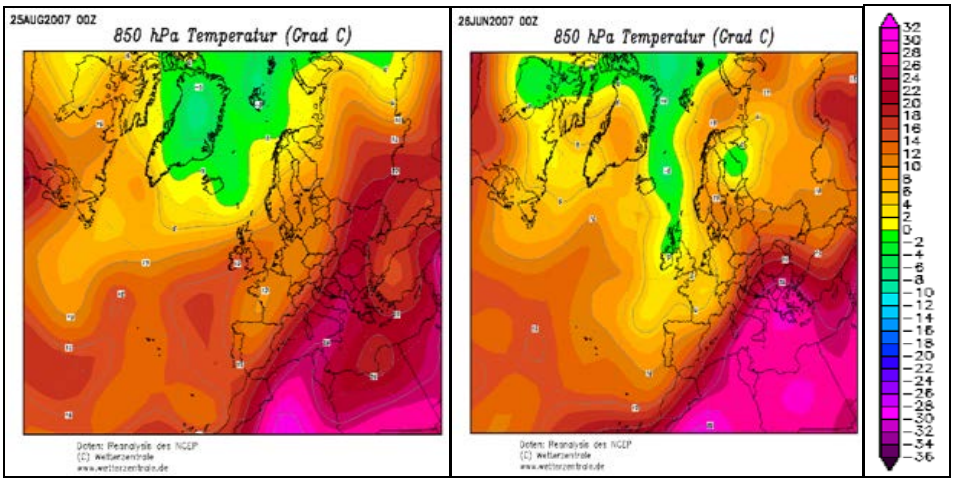

Fig. 4 - The temperature variation at 1,5 km altitude (www.wetterzentrale.de): (left) on 25.08.2007; (right) on 26.08.2007.

The high temperature values recorded during the summer of 2007 in Romania, which resulted in reaching and exceeding the critical level of THI, they were due to the presence at synoptic-scale of the North-African Depression in the southern and central-eastern part of the continent, so by default also in Romania (fig. 4).

In Figure 5, the variation of the THI value nationwide on 25.08.2007 at 16^{00} is represented.

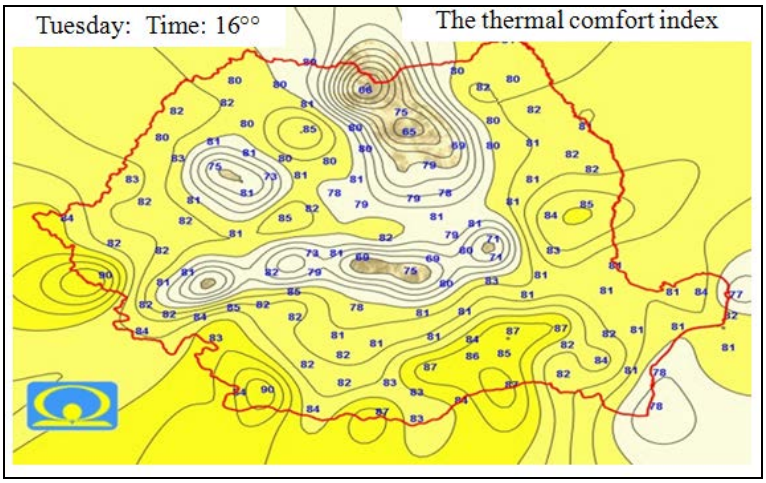

Fig. 5 - The graphical representation of the temperature- humidity index variation nationwide on 25.08.2007 time: 16^{00}.

In August 2007, the THI was exceeded in the second half of the month. According to the Ministry of Health in Romania, the number of deaths caused by the hot weather was of over 30 people; there were over 1,000 people who experienced dizziness while in the open air, and about 9,000 people had requested ambulances.

3.2. The hot weather in the area of Moldova in 2007. The critical value of 80 of the THI thermal comfort index in Moldova was reached and was exceeded in percentage of about 25% of the days of the warm season (in June, in July and in August of 2007).

The first recordings of the overcoming of this index were at the end of June 2007, on the 22, in the South of Moldova (Vrancea District: the Focsani Weather Station registered 36 ºC, a temperature with 10 ºC higher than the standard heat of this period) and on June 26, when the THI values were exceeded in most of Moldova (www.meteoromania.ro).

In July, a ridge relief prevailed consistently in all fields and it determined a very warm weather in this period, even hot in many areas of the country. There were 13 days when the thermal comfort index was exceeded. Of all these, we noticed the interval between 16 and 25 July 2007 in which the THI was exceeded in 10 consecutive days - the first two days in the eastern regions, then all around Moldova (Fig. 6). In this interval, the maximum air temperatures recorded at weather stations reached values of 33/34 ° C in the North (Radauti - Suceava) and up to 41 ºC in the South and in the East (Iasi, Vaslui, Galati and Vrancea districts) (www.meteoromania.ro).

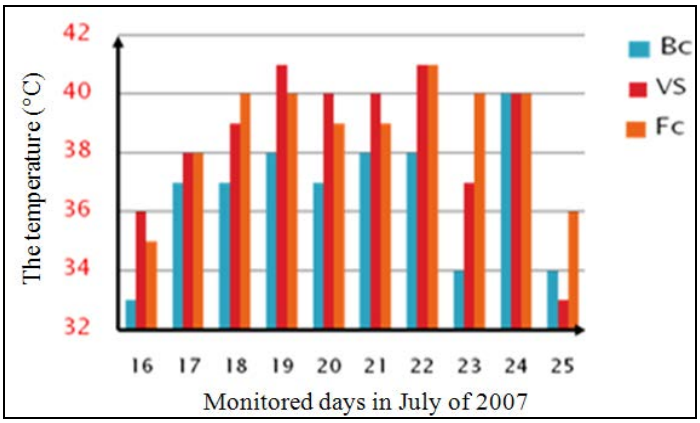

Fig. 6 - Maximum temperatures at the weather stations in Bacau (Bc), Vaslui (Vs) and Focsani (Fc) in July 2007

Tab. 2 - Monthly maximum temperatures in 2007

District	Monthly maximum temperature in 2007			
	May	June	July	August
Suceava	29 °C (Suceava)	34.5 °C (Suceava)	36 °C (Suceava)	37.7 °C (Radauti)
Neamt	34.1 °C (Roman)	37.6 °C (Roman)	38.3 °C (P. Neamt)	37.4 °C (Roman)
Bacau	33.1 °C (Bacau)	38.4 °C (Bacau)	40.3 °C (Bacau)	37.9 °C (Tg. Ocna)
Vrancea	32.5 °C (Focsani)	39 °C (Adjud)	41.1 °C (Focsani)	37.9 °C (Focsani)
Botosani	33.9 °C (Stefanesti)	37.6 °C (Stefanesti)	37.5 °C (Botosani)	37.2 °C (Stefanesti)
Iasi	36 °C (Iasi)	37.4 °C (Iasi)	40.1 °C (Iasi)	38.1 °C (Iasi)
Vaslui	34.8 °C (Vaslui)	38.5 °C (Vaslui)	40.8 °C (Vaslui)	38.2 °C (Barlad)
Galati	33.2 °C (Galati)	37.8 °C (Galati)	40.5 °C (Galati)	40.4 °C (Galati)

In Table 2, the temperature values are presented for May-August 2007, for the districts of Moldova.

The monthly average temperature values in Moldova were: in May 15 ÷ 23 °C, in June 21 ÷ 26 °C, in July 22 ÷ 28 °C, in August 22 ÷ 28 °C.

In August, the THI was exceeded in the second half of the month. The first exceeding of the temperature-humidity index was recorded on August 18, in the South of Moldova (Adjud and Vrancea districts 33 °C) and from 20 to 25 August, when it was reached again, at first in the south, and then it expanded gradually throughout Moldova (on 24 and 25 August, the Galati and Vrancea districts reached maximum temperatures of 40 °C, values with 12 °C higher than the norm of the period) (fig. 7).

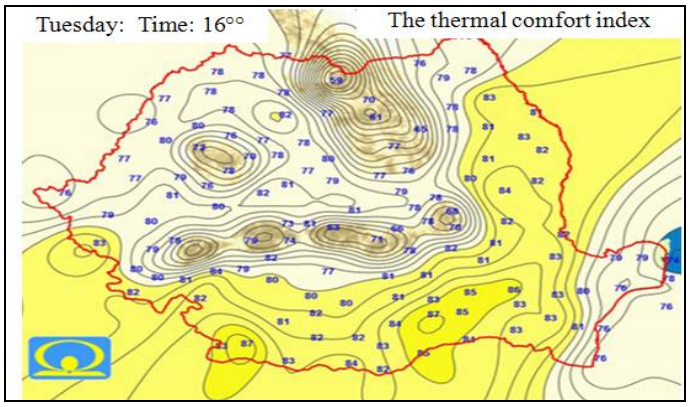

Fig. 7 - The THI variation representation in the South of the country and in Moldova on 25.08.2007

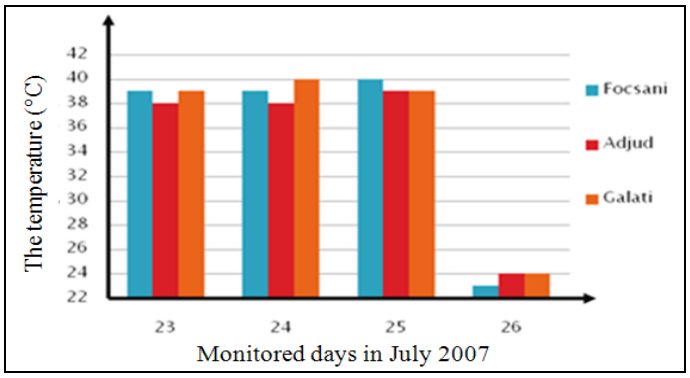

Fig. 8 - Maximum temperatures at the weather stations in the Focsani, Adjud and Galati in August and July 2007

3.3. Aspects related to the adaptation of the body to extreme temperatures. When a heat wave affects an area, the body has no longer time to acclimate. The thermal equilibrium is driven by the thermoregulations centers, which are controlled by the cortex. Largely, the thermoregulation process depends on the "hardening", the adaptation of the body to the large thermal fluctuations, both to higher and lower temperatures. Under the action of high temperatures, the cellular metabolism decreases, the muscle tone shrinks, the vasodilatation occurs, the respiratory rate intensifies and the activity of the sweat glands increases. The human body adapts to high temperature variations altering its blood circulation (NMA 2007).

Policymakers, on medium and long term, should include in the planning of the city architectural and design elements specific to the countries with warm climate:

Tab. 3 - The correlations between extreme temperatures of the air, the body symptoms and first aid measures

Disease	**Symptoms**	**First aid**
- Irritations caused by heat; - The irritations usually occur in high humidity environments, where the sweat can't evaporate easily.	- Irritation characterized by pink or red bumps; - Stinging sensation; itches.	- The skin has to be kept clean and dry in order to prevent infection; - loose clothing of cotton must be worn; - a cool bath has to be taken or rest in a ventilated room in order to reduce the discomfort;
- Cramps caused by heat; - The muscle spasms usually affect the arms, the legs or the stomach, symptoms that occur due to the intense exercises performed in hot environments.	- Muscle cramps; - They occur immediately or a few hours after the cessation of activity.	- The rest in a cool area; - we have to consume liquids; - we must go to the doctor if the cramps don't disappear or if they increase in intensity.
- The exhaustion caused by heat; - It occurs when the body's cooling system is disrupted, more precisely when the body lost a huge amount of water and salts by excessive sweat.	- Cold and damp skin; - headaches; - intense thirst; - dizziness; - sensation of swoon; - intense sweat; - sensation of weakness and fatigue; - the increasing of the pulse and/or low blood pressure.	- we have to move the person to a cool place and then let him/her lay on the back with the legs slightly raised; - application of cold compresses directly on the skin; - administration of liquids which are not very cold.
- apoplexy caused by heat; - it is the most serious disease, it occurs when the body exhausted its reserve of water and salts and the victim's body temperature rises to alarming levels.	- The victim doesn't perspire; - the heartbeats intensify; - accelerated respiration; - intense headaches; - the person is confused, he/she has convulsions and/or he/she seams unconscious.	- the emergency service must be called; - removing the clothing and placing the person on one side in order to expose a larger area of the skin; - the body temperature has to be lowered by applying compresses with cold water.

During extreme heat and high humidity, the body must make an extra effort to maintain a normal temperature. The diseases caused by hot weather start when excessive heat lasts more than two days (Table 3) (NMA 2007).

The most affected population categories are: the elders, the children, the sick people, and the overweight people. The most frequent physiological effects are: skin eruptions, stomach cramps, dehydration (critical factor favoring death), exhaustion, fatigue, syncope (very dangerous) - due to lower blood pressure, increased risk of mortality; the thermal attack (over 40,5 °C) affects cellular structure and it leads to the syndrome of respiratory pain and to the dysfunction of the kidneys and liver (NMA 2012, Teodoreanu 2011).

Vasodilatation occurs at high temperatures, when the body is very hot, the skin capillaries dilate and they eliminate heat. The sweat is a mechanism for maintaining body temperature in a warm environment, where other means of heat loss are hampered. The sweat evaporation process intensifies, especially at high temperatures. Most people start to sweat when the air temperature reaches 29 °C.

Most of the heat wave victims belong to the urban population. Asphalt and concrete store heat for a longer period of time and they release it slowly at night, which leads to high temperatures at night in the urban areas (tropical nights) (NMA 2008).

In rural areas, the air cools faster at night than in the urban areas, because the soil and the vegetation have a low conductivity and a heat storage capacity lower than the urban structures, and the air is less polluted.

Biomedical information and the warning systems of the population, especially of the vulnerable categories, must take into account that subjects answer is different for the same weather conditions, with different threshold values for each category of population (NMA 2012).

- Buildings that allow (by adapting the examples offered by the strategies of the countries with warm climate):

- An inside bioclimatic comfort without using the energy-intensive installations

- An urban bioclimate less stressful, in order to reduce the effect of "heat island" of the cities, during the warm season. The cases of "bad heat" are more numerous in urban areas, especially in the cities with few gardens, parks, green alleys, fountains. The factors that determine the vulnerability to heat are factors of individual risk of medical, behavioral and environmental nature (NAM 2012).

3.4. IR cooling Index. The cooling index is a measure of the felt temperature and it depends on the air temperature and on the wind speed. The mathematical formula for this index was designed starting from the analysis of the way in which the thermal protective layer existing around the human body is destroyed in

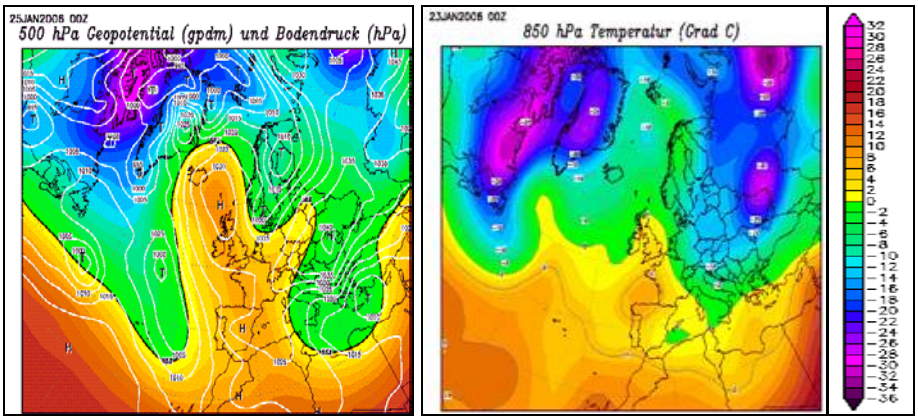

Fig. 8 - Graphical representation of the thermal and geopotential field:
(left) on 23.01.2006; (right) on 25.01.2006.

Tab. 4 - The relationship between the wind speed and the air temperature.

T °C	Wind speed (m/s)									
	0	2	4	7	9	11	13	16	18	
4.4	4.4	2.8	-2.2	-5.6	-7.8	-8.9	-10.6	-11.7	-12.2	REDUCED RISK
1.7	1.7	-1.7	-5.6	-8.9	-11.1	-13.3	-14.4	-15.6	-16.1	
-1.1	-1.1	-2.8	-8.9	-12.8	-15.6	-17.8	-18.9	-20.0	-22.8	STATE OF ALERT
-3.9	-3.9	-5.6	-12.2	-16.7	-19.4	-21.7	-23.3	-24.4	-25.0	
-6.7	-6.7	-8.9	-16.1	-20.6	-23.3	-27.8	-27.8	-28.9	-29.4	
-9.4	-9.4	-11.7	-19.4	-23.9	-27.2	-30.0	-31.7	-32.7	-33.9	HIGH RISK
-12.2	-12.2	-14.4	-22.8	-27.8	-31.1	-33.9	-36.1	-37.2	-38.3	
-15.0	-15.0	-17.8	-27.8	-31.7	-35.0	-37.8	-40.6	-41.7	-42.8	
-17.8	-17.8	-20.6	-30.0	-35.0	-39.4	-42.2	-45.0	-46.7	-47.2	
-20.6	-20.6	-23.3	-32.7	-38.9	-43.3	-46.1	-48.9	-50.0	-51.5	
-23.3	-23.3	-27.8	-36.7	-42.8	-47.2	-50.6	-53.3	-55.0	-56.1	
-27.8	-27.8	-29.4	-40.0	-46.1	-51.1	-54.4	-57.2	-58.9	-60.0	
-28.9	-28.9	-32.2	-43.3	-50.0	-55.0	-58.9	-61.7	-63.3	-64.4	
-31.7	-31.7	-35.0	-46.7	-53.9	-58.9	-62.3	-65.6	-67.2	-68.9	
-34.5	-34.5	-37.8	-50.0	-57.8	-63.3	-66.7	-70.0	-72.2	-72.8	

situations of low temperatures and intense wind. Thus, the body temperature becomes closer to the environmental air and the cold sensation will be stronger. In some situations, in which the air temperature has extremely low values (-20 °C), or when the cooling index goes down below the index value of -32 °C, the

Government Emergency Ordinance no. 99/2000 applies, relating to the measures which are necessary for the protection of the employed persons in the periods of extreme temperatures (NMA 2012).

The human body can feels air temperatures much lower than those indicated by the thermometer, according to the humidity or wind speed (Tab. 4).

At the beginning of the year 2006, the evolution of the weather in Romania was characterized by record values of temperature decreases well below the multi-annual averages (the last decade of January and the first half of February). In the second part of January, a mass of arctic air caused strong frost in the Eastern Europe (Fig. 8).

In winter, about 60 % of the energy of the body is used to warm itself. Our ability to adapt to the cold winter is also lower due to the habitats which are too heated and to the sedentary lifestyle. The impact of the sudden passing from hot to cold, is powerful and stressing for the heart. The respiratory system can react with a sudden spasm at the cold air inhalation and the immune response is attenuated, which can lead to disease (Bordei 2008).

The extreme temperatures in Romania in 2006 were of:

a) -27 °C in Darabani (January 23);

b) -30 °C in Intorsura Buzaului (January 24);

c) -33 °C in Miercurea Ciuc (25, 26 and 27January). During the 22 ÷ 27 January 2006, the minimum temperatures were very low in the Eastern and in the South-Eastern of Romania and in the first 3 days, the index of cooling dropped below the -32 units in most of Moldova, Dobrogea and East Wallachia (NMA 2008).

3.5. The impact of the extreme temperatures on the economic and social life. According to the Ministry of Health, the County Directorates of Public Health, registered 27 deaths caused by low temperatures, of which 7 in the Eastern of Romania, from 22 ÷ 25 January 2006 in the following counties: Dolj (1), Constanta (2), Ialomita (2), Covasna (1), Mehedinti (1), Bacau (1), Braila (1), Neamt (1), Galati (3), Suceava (1), Arad (1), Iasi (1), Timis (3), Valcea (1), Maramures (1), Dambovita (1), Prahova (3), Bucharest (2).

In this period, road and rail traffic had significant disturbances, houses weren't heated enough due to the low pressure of the natural gas in the distribution network, the Danube was 90 % frozen and the sailing was affected, the sea ports were closed.

3.6. Physiological effects caused by low temperatures. The sudden cooling of the weather leads to the increase of the number of deaths due to cardiovascular disease. In the periods with low temperatures, the level of the sediments in the blood is low, the coagulation is done quickly and this can cause infarction (ANM 2007, Teodoreanu E. 2011).

The capillary vessels are more fragile, and the brain vascular problems occur more frequently in children born during cold. Respiratory diseases have a more acute manifestation in January, February and March. The most common respiratory diseases are: the flu, the pneumonia, the bronchopneumonia. The elders and the children are the most affected (NMA 2007, Teodoreanu E. 2011).

Conclusions

The air temperature might be a factor with pathogenic action on the human body when its variability determines physiological reactions that limit the exercise capacity and provide favorable conditions for pathogen development.

The factors that determine variations of the temperature value are: the latitude, the land and the water surface, the ocean currents and the altitude.

Among the National Meteorology Administration responsibilities, there are aspects of population information through the media about the areas in which the temperature, the temperature-humidity index or the index of cooling reach critical threshold values.

By combining the temperature and humidity values, the thermal comfort can be defined and the interval when the human body doesn't lose heat and it doesn't receive heat can be identified.

The analysis of the recorded data from all 24 weather stations in Romania shows that 2007 was the warmest in the last 107 years.

In the summer of 2007, in Romania the THI value exceeded the critical level mainly due to the presence at synoptic-scale of the North-African Depression in the South and the Central-Eastern European continent.

In Moldova, during the summer months of 2007 (in June, in July and in August) the critical value of 80 units of the THI was exceeded by about 25 %.

The urban areas create a microclimate that causes increased heat wave phenomenon as demonstrated by the many victims of the hot weather among the urban population.

In the urban areas, where there are problems related to the effects of the hot weather, the strategies related to architecture and building structure as well as the extension of the green spaces should be implemented.

The data recorded from 22 ÷ 25 January 2006 showed that low temperatures during this period caused seven deaths in the counties of Moldova.

The sudden variations of temperature cause problems of acclimatization for the human body and an additional effort in order to maintain a normal temperature. The extreme values of temperature cause increased cardiovascular problems and even the increase of the number of deaths.

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