

# UCI KOREY Practical Guide for Estimating the WBGT Index User Guide

## UCI KOREY Practical Guide for Estimating the WBGT Index

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## TAYYEB POST

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## MAIN FEATURE IMAGE MISSING

### IMPORTANT INFORMATION

The present document is a practical guide that complements the Annex C of the UCI Road races regulations, which deals with the countermeasures to be taken during road races organized with high temperatures. It provides a simple way for estimating the **WBGT** climatic index and assessing the heat-related risks during a cycling road race. Exposure to heat during training or competition is at the origin of impaired physical performance but above all, is the leading cause of severe exercise-induced heat illnesses, such as exertional heat stroke.

**According to the new Annex C, the prevention of heat-related injuries and the preservation of riders' health require,**

- a proper and appropriate assessment of the environmental heat stress using a validated climatic index,
- risk mitigation measures based on the severity of the climatic index.

### How to estimate the environmental heat stress?

Different heat stress indices can be used to determine how dangerous a given set of environmental conditions are to human health. The Wet Bulb Globe Temperature (WBGT) index is likely the more robust heat stress, since it accounts for the effect of air temperature, humidity, solar radiation and wind speed on human body temperature. The WBGT index is currently used by several international federations to guide their heat safety guidelines and recommendations.

WBGT is typically measured using specific devices that either directly measures or approximates individual

components of the index. Many devices are available, but most do not respect the original standards. However, accurate systems are expensive, should be mounted atop tripods, localized very precisely and are therefore very difficult to use during cycling road races.

WBGT can be estimated reliably from weather station observations available on open websites and frequently updated. Several methodologies have been developed to estimate WBGT using weather station measurements but varying in accuracy and computational complexity. The physically based model published by Lierne et al. (2008) is likely one of the most accurate methods for estimating WBGT.

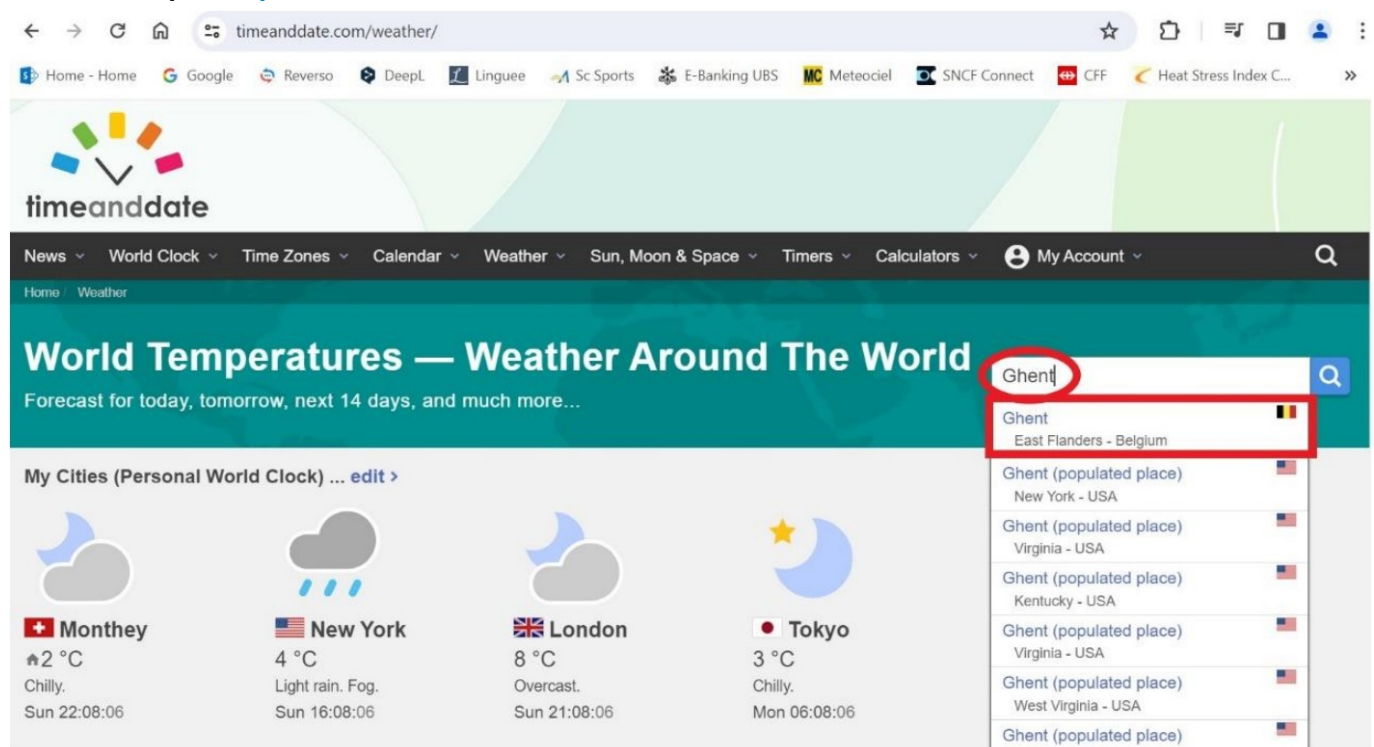
Four main variables are needed to estimate WBGT with this model, and two of these variables are available from weather station observations through reference websites. These variables are,

- ✓ Ambient temperature, Td
- ✓ Relative humidity, %.

#### A- Search for weather information on official reference sites.

The latest values for these environmental parameters can be found on reference weather station websites, such as,

a- first example. <https://www.timeanddate.com/weather/>



The screenshot shows the timeanddate.com website. The search bar is highlighted with a red box, and the results for 'Ghent' are shown below it. The results list 'Ghent' as 'East Flanders - Belgium' and include several other locations with the same name, such as 'Ghent (populated place) New York - USA', 'Ghent (populated place) Virginia - USA', 'Ghent (populated place) Kentucky - USA', 'Ghent (populated place) Virginia - USA', 'Ghent (populated place) West Virginia - USA', and 'Ghent (populated place)'.

City	Country	Temperature	Weather	Time
Monthey	Switzerland	2 °C	Chilly.	Sun 22:08:06
New York	USA	4 °C	Light rain. Fog.	Sun 16:08:06
London	UK	8 °C	Overcast.	Sun 21:08:06
Tokyo	Japan	3 °C	Chilly.	Mon 06:08:06

Enter the place you want to search in the search box, here Ghent in Belgium.

timeanddate.com/weather/belgium/ghent

Home - Home Google Reverso DeepL Linguee Sc Sports E-Banking UBS Meteociel SNCF Connect CFF Heat Stress Index C...

timeanddate

News World Clock Time Zones Calendar Weather Sun, Moon & Space Timers Calculators My Account

**Weather in Ghent, East Flanders, Belgium** Search for city or place...

Time/General Weather Time Zone DST Changes Sun & Moon

Weather Today Weather Hourly 14 Day Forecast Yesterday/Past Weather Climate (Averages)

**Now**  
**7 °C**  
 Overcast.  
 Feels Like: 4 °C  
 Forecast: 12 / 6 °C  
 Wind: 11 km/h from South

Location: Vlissingen  
 Current Time: 28 Jan 2024, 22:13:52  
 Latest Report: 28 Jan 2024, 21:00  
 Visibility: 25 km  
 Pressure: 1024 mbar  
 Humidity: 78%



The next screen (see above) provides the required information. You can easily check the current time and the time of the latest report in the blue box. The latest values of the ambient temperature and relative humidity are available in the red boxes.

**b- second example.** <https://www.meteociel.fr/>

Accueil 4372 visiteurs

Menu Utilisateur

- Inscription
- Se connecter
- Meteociel Android
- Meteociel IOS
- Héberger image
- Forums Meteociel
- Tchat météo (10)

Temps réel

- Observations
- Poster vos obs.
- Détails des obs.
- Galerie des obs.
- Carte des photos
- Partager une photo
- Température**
- Température min
- Température max

Photos de la galerie [ Partager vos photos ]

Image Satellite IR

Vigilance météo

News et actualités météo (Lire les archives)

16/01/2024 : Pluies verglaçantes/neige du 16/18 janvier 2024  
 15/11/2022 : Cartes des modèles saisonniers Copernicus C3S  
 08/11/2022 : Nouveaux modèles COSMO-5M et COSMO-2I  
 02/09/2022 : Ensemble ECMWF 51 scénarios disponibles  
 01/09/2022 : AROME passe à 8 runs par jour  
 01/09/2022 : Passage à 102h de l'ensemble ARPEGE (PEARP)  
 08/07/2022 : Nouveaux records battus en juin 2022  
 01/07/2022 : Normales météorologiques 1991-2020

Rechercher Google

Observations météo : le temps qu'il fait en ce moment [ Participer ]

France Régions France **NEW!** DOM-TOM Europe Reste du monde

Hauts-de-France Grand-Est Ile-de-France Pays-de-la-Loire PACA Bretagne Corse

Occitanie Nouv.-Aquitaine Nord Nouv.-Aquitaine Sud Auvergne-Rhône-Alpes

Les publicités nous permettent de garder le site gratuit, de louer les serveurs et d'acheter des données météo (observations de Météo-France, modèles et ensembles ...)

Soutenez-nous en débloquent les publicités sur ce site !

Cliquer ici pour voir comment faire

On the homepage, select "Temperature", red oval above.

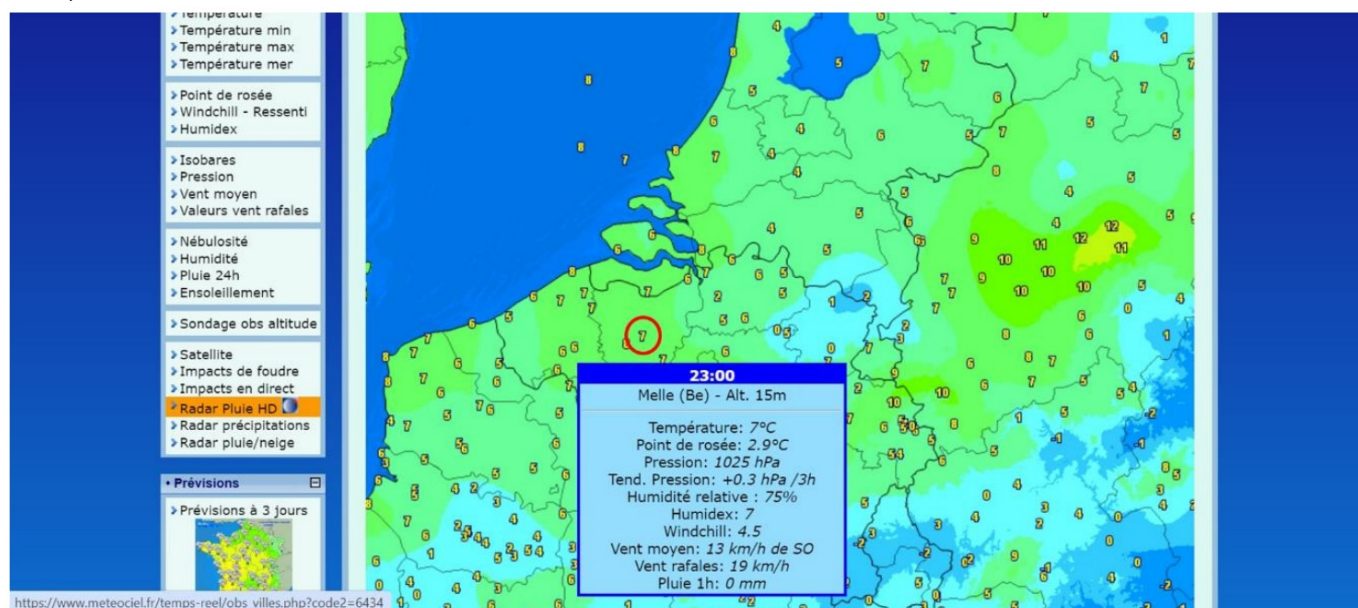




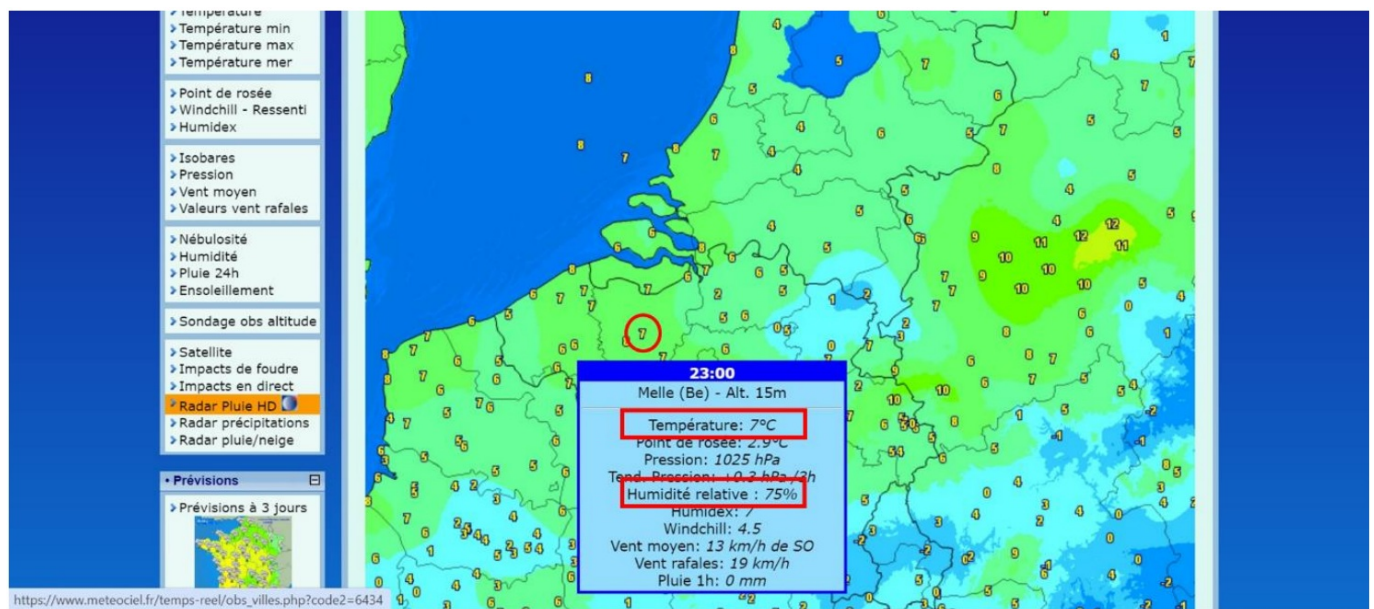
Then, select "Europe".



Then, select "Benelux".



Then select the town you want to look for, or the location of the nearest weather station. Here Mele, weather station near Ghent.



The latest values of the ambient temperature and relative humidity are available in the red boxes.

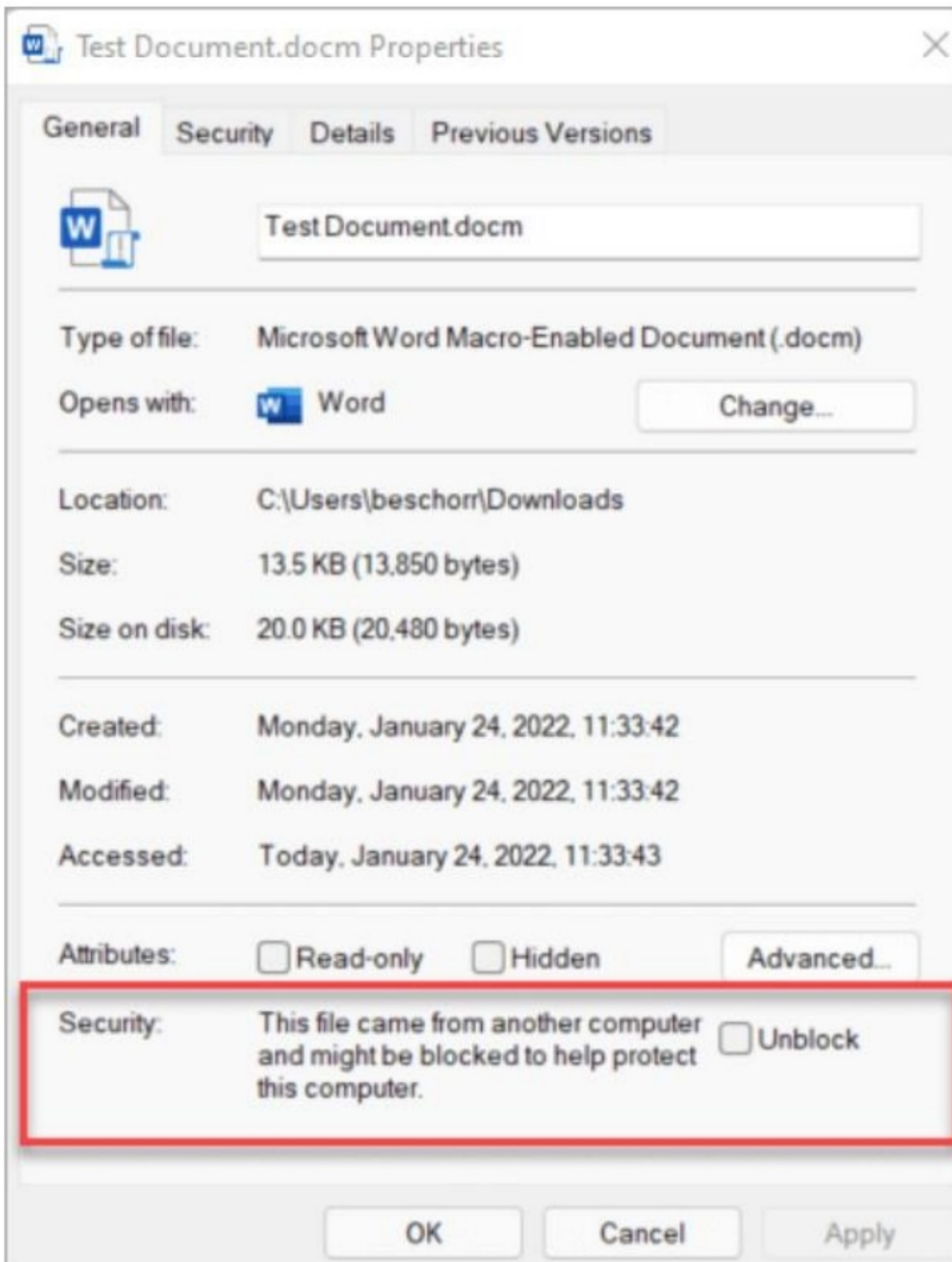
## B- Estimate of the WBGT index for road cycling events.

To estimate the WBGT index, use the file available at the following link,

<https://uciofficiel.sharepoint.com/:f:/s/UCIMedical/EqGg3j4eRktLlvRIW1etdksBijijp5MNCIAq8SWqzf6vwQ?e=repDol>

Then,

- download the Excel file to your computer
- right-click the file and choose “Properties”
- at the bottom of the General tab, select the Unblock checkbox and select OK (see the screenshot below)



- you can now open the file, edit it and keep it for future use.

**To estimate the WBGT index, you will use,**

- the two environmental variables obtained from weather station websites (see above)
- wind speed (see below)
- radiant temperature (calculated directly in the model used below)



The screenshot shows an Excel spreadsheet with the following data:

Row	Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J	Column K	Column L
1	Calculation WBGT & UTCI							Version 2				
2	Input Data:											
3	Ambient temperature(C)	32.0										
5	Globe temperature (C)	41.2	or Solar Radiation (w/m <sup>2</sup> )									
7	Dew point (C)		or Relative Humidity (%)	30								
9	Wind Speed (m/s)	12.5										
11	Output:											
12	UTCI	44.1	Needs ambient temperature, globe temperature OR solar radiation, dew point OR relative humidity and wind speed.									
14	WBGT(outdoors)	25.6	Needs ambient temperature, globe temperature OR Solar radiation, dew point OR relative humidity and wind speed.									
16	WBGT(indoors)	22.9	Needs ambient temperature, dew point OR relative humidity and wind speed.									
17												

Enter the values for ambient temperature and relative humidity (blue boxes above on the screenshot).

Cycling is characterized by significant heat loss through the speed of penetration in the air (heat convection loss in the air). In order to reproduce the favorable effects of air penetration, a value for the average speed of the peloton expected during the event (expressed in m/s) must be entered in the “Wind Speed” box (green box above on the screen).

40 km/h = 11.1 m/s

45 km/h = 12.5 m/s

50 km/h = 13.9 m/s

The estimated value of the WBGT index appears in the “WBGT (outdoors)” cell (red box above on the screen).

## Risk assessment and countermeasures

The risk assessment of heat-related injury and the implementation of countermeasures to mitigate the risks to riders' safety are based on an objective assessment of the environment.

**The risk assessment can be expressed in the form of a colour code,**

- White zone (WBGT below 15°C), very low risk;
- Green zone (WBGT between 15°C and 17.9°C), low risk;
- Yellow zone (WBGT between 18°C and 22.9°C), moderate low risk;
- Orange zone (WBGT between 23°C and 27.9°C), moderate high risk;
- Red zone (WBGT above 28°C), high risk.

## Counter measures

Preventive measures should be discussed and determined during the meeting organised with representatives of the stakeholders. Recommendations for countermeasures are given below, with the final choice remaining the responsibility of the meeting participants. Countermeasures to be implemented will depend on the severity of the hot weather, i.e. value of the WBGT index, and several other parameters.

## WBGT values


- White zone, no specific countermeasures.
- Green zone, warm-up in the shade with fans, skin protection with non-greasy sun creams, choice of light coloured clothing, normal hydration plan.
- Yellow zone, warm-up with ice vests, use of fresh towels, application of strict, individualized hydration plans, distribution of “ice-socks”, supply of ice to the teams during the race.
- Orange zone, adaptation of the start area to keep riders in the shade before the start, protect officials, organizing staff and volunteers from the sun, increase the number of neutral motorbikes providing riders with drinks and ice packs, adapt the rules limiting hydration and cooling in competition.
- Red zone, modification of start and finish times, possible neutralization of a section of the race or stage, cancellation of the stage/race.

## Other parameters to take into consideration.


- Race or stage profile. The convective advantage given by the high velocity in cycling will disappear during up-hill where the racing speed is lower.
- Race route conditions. Long shaded sections or not.
- Heat acclimation status.

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## Documents / Resources

	<a href="#">UCI KOREY Practical Guide for Estimating the WBGT Index</a> [pdf] User Guide KOREY Practical Guide for Estimating the WBGT Index, KOREY, Practical Guide for Estimating the WBGT Index, Guide for Estimating the WBGT Index, Estimating the WBGT Index
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## References

-  [Sign in to your account](#)
-  [Meteociel - Météo - observations météo en temps réel et prévisions météo pour la France](#)
-  [World Temperatures — Weather Around The World](#)
- [User Manual](#)