

## EUPORIAS WP22 Climate Impact Indicators (CII)

Based on **Milestone 19 from WP22**, a preliminary set of Climate Information Indices (CII) was defined to cover different economic sectors. These CII are: the Fire Weather Index (**FWI**), the Physiological Equivalent Temperature (**PET**), the Occurrence of Temperatures below  $-17^{\circ}\text{C}$  (**T<-17°C**), the Growing Season Suitability (**GSS**), the Growing Season Precipitation (**GSP**), the Cool night Index (**CI**), the Hugin Heliothermal Index (**HI**), the Hydrothermic Index (**Hyl**), the Upper Wind Speed (**CFU**), the Temperature related Mortality Index (**UDIC**) and the Heating Degree Days (**HDD**). Below, all of them are briefly described.

- **FWI**: The Fire Weather Index represents the intensity of a spreading fire as energy output rate per unit length of fire front, which is used as a general, daily-based indicator of fire danger.
- **PET**: The Physiological Equivalent Temperature (PET) is a universal index for characterizing the thermal bioclimate at any given place (outdoors or indoors). This index is equivalent to the air temperature at which, in a typical indoor setting, the heat balance of the human body is maintained with core and skin temperatures equal to those under the conditions being assessed.
- **T<-17°C**: Annual mean number of days with minimum temperature below  $-17^{\circ}\text{C}$ .
- **GSS**: The Growing Season Suitability represents the fraction of days from April to September with daily mean air temperature above  $10^{\circ}\text{C}$ .
- **GSP**: The Growing Season Precipitation is the precipitation accumulated from April till September.
- **CI**: The Cool night Index average minimum air temperature in September.
- **HI**: Hugin Heliothermal Index is a degree-day formulation that weights maximum temperatures above daily mean temperatures and applies a latitude-varying day-length adjustment.
- **Hyl**: The Hydrothermic Index is just the product of temperature and precipitation from April to September.
- **UDIC**: Temperature-related mortality index. A transfer function (i.e. temperature/mortality relationship) is calculated using historical data and a statistical model is fit to cold and warm tails to estimate future mortality using forecast daily temperatures.
- **CFU**: Upper wind speed threshold for wind turbine operation: This wind speed threshold is approximately 16 m/s (depending upon turbine specifications), above which a turbine braking system is applied to slow down or stop it from spinning, to protect mechanical equipment from damage. The Index would be based on the number of days above this wind speed threshold, over seasonal timescales.
- **HDD**: Heating Degree Days

All these CII require different variables with different temporal frequencies as input data.

Variables needed by the CII's	Time Frequency	CII's
Surface temperature	Daily	GSS, HI, Hyl, HDD, UDIC
Surface temperature	Instantaneous at 7am, 2pm and 9pm (local time)	PET
Surface temperature	Instantaneous at noon local standard time or daily maximum	FWI
Minimum temperature	Daily	T<-17°C, CI
Maximum temperature	Daily	HI
Dew point temperature	Daily	UDIC
Wind Speed	Monthly mean	CFU
Wind Speed	Instantaneous at 7am, 2pm and 9pm (local time)	PET
Wind Speed	Instantaneous at noon local standard time or daily mean	FWI
Surface moisture	Daily	UDIC
Precipitation accumulated over 24h	Instantaneous, Daily	FWI
Precipitation	Daily	GSP, Hyl
Relative Humidity	Instantaneous at noon local standard time or daily mean	FWI
Relative Humidity	Instantaneous at 7am, 2pm and 9pm (local time)	PET
Short wave radiation flux	Instantaneous at 7am, 2pm and 9pm (local time)	PET
Long wave radiation flux	Instantaneous at 7am, 2pm and 9pm (local time)	PET
Cloudiness (in octas)	Instantaneous at 7am, 2pm and 9pm (local time)	PET

Note that the calculation of these CIs involve particular variables at specific local times in some cases. However, the SPECS-EUPORIAS data portal does only intend to make available a reduced number of variables (typically surface variables such as precipitation and temperatures) at certain UTC times. Therefore, feedback from end-users is needed in order to define the common set of variables/UTC times which will be stored, taking into account the requirements for (among others) the calculation of the above CIs.