# Annex 9 - Analyses of variations in climatic factors in the localities of interest

# 1 Analyses of variations in climatic factors in the localities of interest

The site of the works is located on the Argeș river downstream of the Mihăilești - Cornetu lake and on the Dâmbovița river downstream of the bridge on the Bucharest ring road, in the counties of Ilfov, Giurgiu and Călărași.

At the level of each county, the territorial administrative units (TAUs) intersected by the project site are as follows:

# ✤ <u>Ilfov County</u>

The project site will cross the following localities in Ilfov County: Vidra, 1 Decembrie, Copăceni, Darăști, Măgurele, Cornetu, Cernica, Glina.

# Călărași County

The project site will cross the following localities in Călărași County: Budești, Chirnogi, Crivăţ, Curcani, Frumușani, Fundeni, Gălbinași, Mitreni, Oltenița, Plătărești, Radovanu, Șoldanu.

# \* Giurgiu County

The project site will cross the following localities in Giurgiu County: Adunații Copăceni, Colibași, Comana, Goștinari, Isvoarele, Herăști, Hotarele, Mihăilești, Valea Dragului.

The analysis of the variation of climatic factors will be conducted at the level of each TAU intersected by the project.

In order to analyse the climate variables, temperature variation, precipitation, global solar radiation, wind intensity/velocity, publicly available data were used, as shown in the table below.

No.	Climate variables	Methodology	Data source
1	Low temperature extremes	- Analysis of temperature evolution in the project area	RO-ADAPT Platform - Analysis of climatic parameters at TAU level ( <u>https://www.roadapt.ro/roadapt/#tab-1431-11</u> )
2	High temperature extremes	<ul> <li>Analysis of temperature evolution in the project area</li> </ul>	RO-ADAPT Platform - Analysis of climatic parameters at TAU level ( <u>https://www.roadapt.ro/roadapt/#tab-1431-11</u> )
3	Extreme precipitation (rainfall)	- Analysis of the evolution of annual average rainfall	RO-ADAPT Platform - Analysis of climatic parameters at TAU level ( <u>https://www.roadapt.ro/roadapt/#tab-1431-11</u> )"
4	Strong wind	<ul> <li>Analysis of areas with high wind speeds</li> </ul>	RO-ADAPT Platform - Analysis of climatic parameters at TAU level ( <u>https://www.roadapt.ro/roadapt/#tab-1431-11</u> )

# 2 Generalities about climate factors

The average air temperature is on an upward trend all year round. The maps below show the deviation of the average temperature in January 2024, April 2023, July 2023 and October 2023 from the average temperatures recorded between 1961 and 2023 in the same months.

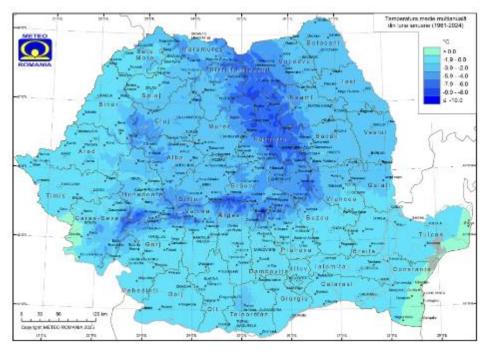


Figure No. 1 Deviation of the average temperature in January 2024 from multiannual average (1961-2024)

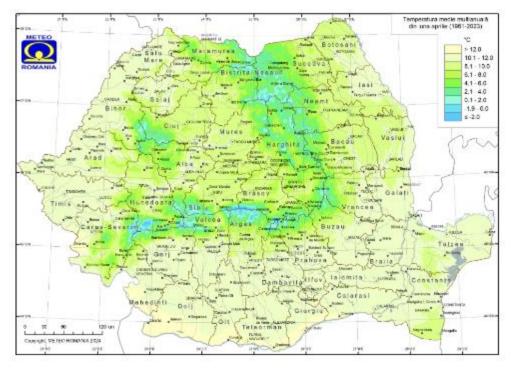


Figure No. 2 - Deviation of average temperature in April 2023 from the multiannual average (1961-2023)

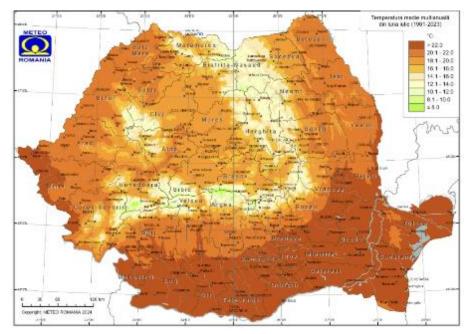


Figure No. 3 - Deviation of average temperature in July 2023 from multiannual average (1961-2023)

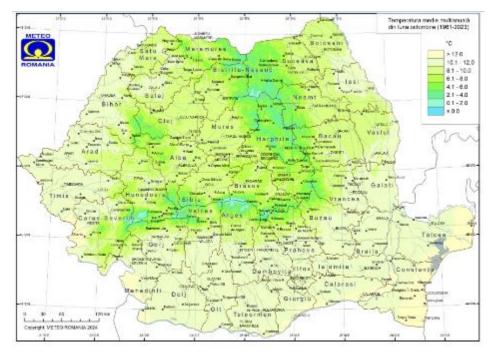


Figure No. 4 - Deviation of average temperature in October 2023 from multiannual average (1961-2023)

In accordance with the report of the National Hydrology Authority on *"Climate Change - from physical fundamentals to risks and adaptation*", a "heat wave" is defined in Romania, in accordance with the measures taken to combat the effects on the population, as an interval of at least 2 days with a maximum temperature of over 37 degrees. Persistent heatwaves have become extremely common over the past decade, compared with earlier periods.

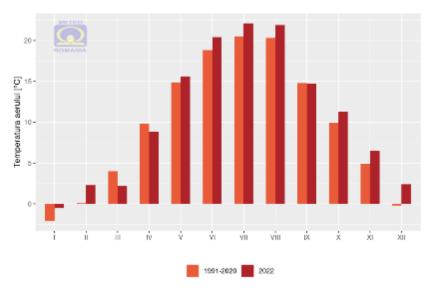


Figure No. 5 - Evolution of the average monthly temperature in Romania in 2023, compared to the median of the standard climatological interval (1991 -2022)

The lack of atmospheric precipitation is one of the major factors contributing to dryness and drought. Excess rainfall also leads to flooding and excess moisture.

The regime and territorial occurrence of atmospheric precipitation is determined by: the general atmospheric circulation and the particularities of the active surface structure.

Analysis of the multiannual variation of annual precipitation on Romania's territory indicate the occurrence of a series of dry years after 1980. The main cause is the decrease in precipitation amounts in conjunction with the upward trend in average annual temperature.

With the onset of the phenomenon of decreasing precipitation in recent years, another phenomenon has emerged, namely the decrease in the flow of most rivers under the effect of factors such as:

- the decline in annual rainfall since the 1980s
- increase in average annual air temperature leading to increased evaporation and evapotranspiration;
- decrease in groundwater levels with negative implications for groundwater supply in seasons low in precipitation.

Precipitation is determined by air humidity and atmospheric cloudiness. Air humidity values are quite high, ranging between 75-80%, reflecting the influence of the westerly circulation. The cloud amount has annual mean values of 5.5 and corresponds to a relative humidity of less than 75%.

According to data provided by the Romanian Weather Service, the maps below show the deviation of the average temperature in January 2024, April 2023, July 2023 and October 2023 from the average temperatures recorded between 1961 and 2023 in the same months.

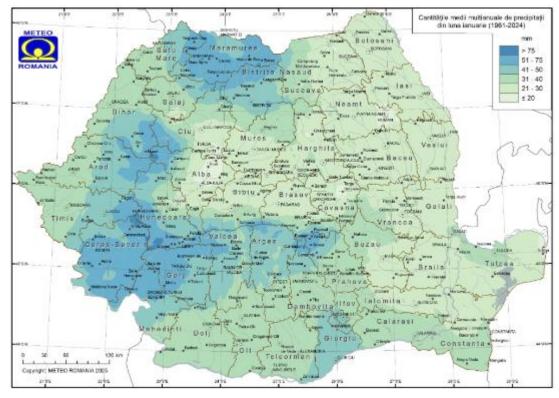


Figure No. 6-Deviation of average monthly precipitation in January 2024 compared to 1961 -2024

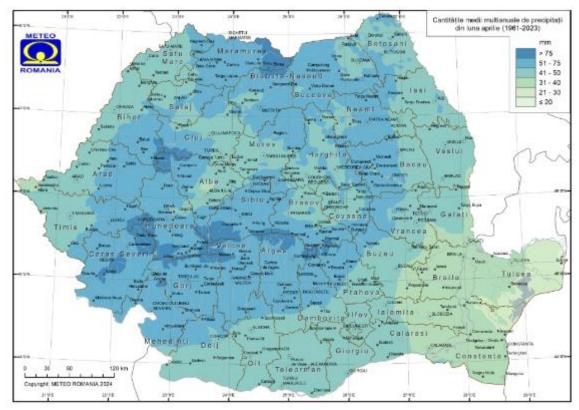


Figure No. 7 - Deviation of average monthly precipitation in April 2023 compared to 1961 -2023

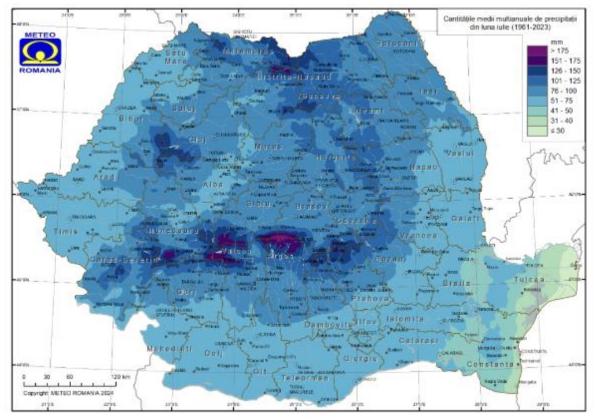


Figure No. 8 - Deviation of average monthly precipitation in July 2023 compared to 1961 - 2023

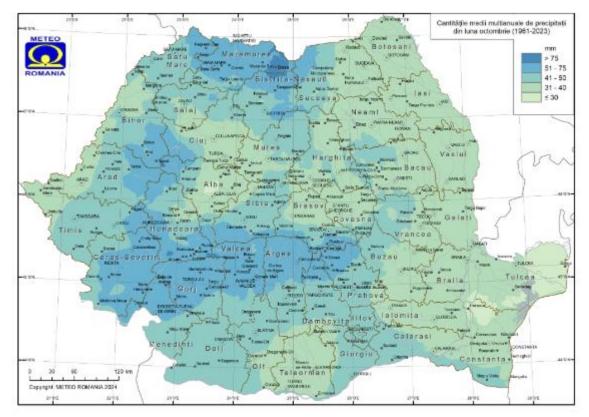


Figure No. 9 - Deviation of average monthly precipitation in October 2023 compared to 1961 -2023

Annual mean wind speed decreases of 93% were recorded at all stations in Romania. These data indicate an average annual wind speed of 1-2 m/s.

The available data leads to the conclusion that there will be a reduction in the average wind speed in the project reference area. With regard to extreme wind speeds (thunderstorms, tornadoes), "Tornadoes in Romania" (B. Antonescu, A. Bell - 2014) shows that they are possible in the project area, but are not a characteristic of the site.

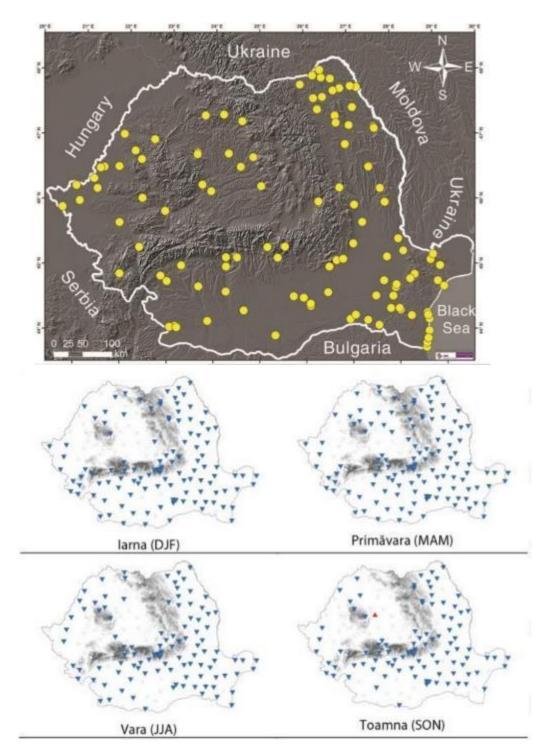


Figure No. 10 - Trends in mean wind speed and extreme wind events

# 3 Climate factors - Ilfov County

#### 3.1 Vidra

#### 3.1.1 <u>Temperature variability</u>

As for the temperature evolution at the Vidra weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

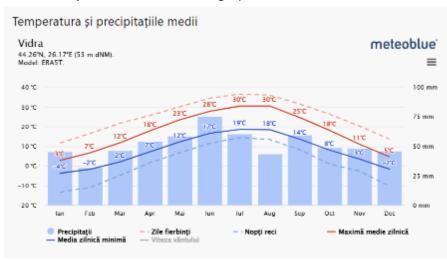
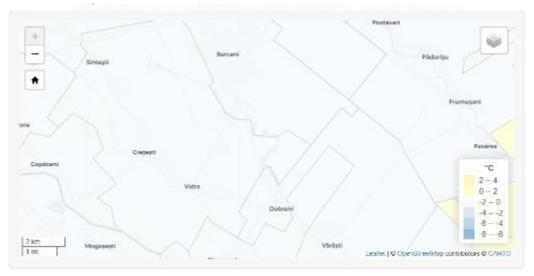


Figure No. 11 - Average value of extreme temperatures over the last 30 years at Vidra weather station <sup>1</sup>

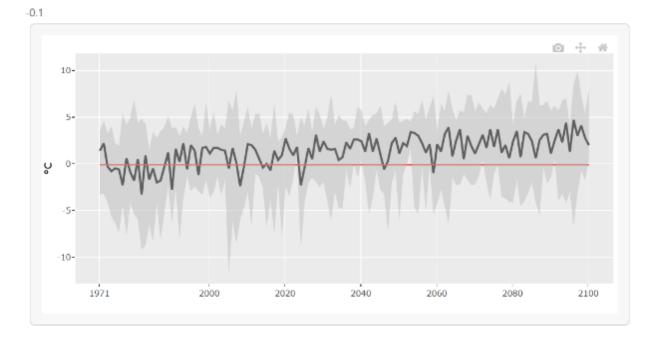
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - Februarv 1971-2000

Figure No. 12 - Average temperature in Vidra TAU (period 1971 -2000)

<sup>&</sup>lt;sup>1</sup> Source: *www.meteoblue.com* 



Average temperature in February RCP45 (Vidra - County of Ilfov) - reference period 1971-2000 Average values for 1971-2000

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February RCP45 (Vidra - County of Ilfov) - reference period 1971-2000 Average values for 1971-2000

-0.1

Show 5	i rows <del>*</del>	Сору	CSV	Excel			Search: 207	1
date ≬	med 🌗	min (	max 🌗	an (	change_med (	change_max (	change_min	med_1971_2000
2071- 02-28	2.1	-1.2	6.5	2071	2.2	6.6	-1.7	1 -0.
showing	1 to 1 of 1	l entries (	filtered fr	om 130	total entries)			evious 1 Next

Average temperature in February RCP45 (Vidra - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click pe hartă</sup> (regiunea de interes) pentru actualizare grafic și valori

0.1

							Search: 21	00
late ≬	med ≬	min 🕴	max 🌗	an ≬	change_med	change_max ≬	change_min	med_1971_200
100- )2-28	2	0.3	7.9	2100	2.1	8	0	).4

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

#### 3.1.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

With the impact that climate change may have on infrastructure in particular, this factor can have negative effects on the population. In this respect, it is recommended that road/naval infrastructure projects should consider the use of materials that contribute to the reduction of such stress.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is  $103.7 \text{ W/m}^2$ .



Solar radiation - RCP45 Scenario - multi-annual average values in February, period 1971-

Global solar radiation in February RCP45 (Vidra - County of Ilfov) - reference period 1971-2000

103.7

Show 5	rows +	Сору	CSV	Excel				
							Search: 2071	
date ≬	med 🌢	min 🕴	max 🌢	an ≬	change med 🌢	change max ≬	change min ≬	med 1971 2000 ≬
2071- 02-15	93	68	128.9	2071	-10.7	25.2	-35.7	103.7
Showing 1	to 1 of 1	entries (f	iltered fro	om 130 i	total entries)			ous 1 Next

Global solar radiation in February RCP45 (Vidra - County of Ilfov) - reference period 1971-2000

```
Media 1971-2000 Click pe bartă (regiunea de interes) pentru actualizare grafic și valori
103.7
```

							Search: 2100	
date 🕚	med 🌘	min ≬	max 🕚	an ≬	change_med ()	change_max 🔷	change_min (	med_1971_2000
2100- 02-15	108.2	59	136	2100	4.5	32.3	-44.7	103.7

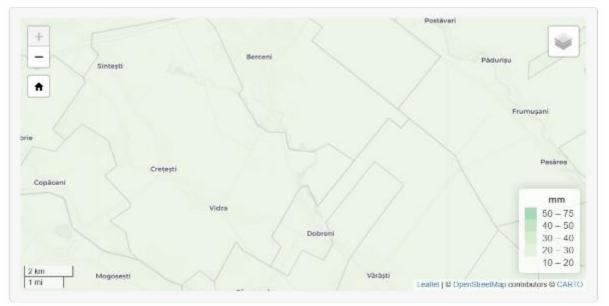
According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93 W/mp, and at the level of year 2100 it is estimated at 108.2 W/mp, which is higher than the multiannual average value of 103.7 W/mp. We can observe a decreasing trend of solar radiation in the Vidra ATU in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

#### 3.1.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.3 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 24.6 m, and by 2100 it will reach 27.4 mm. An increasing precipitation trend can be observed for the period 2000 -2071 but also for the period 2071 -2100.





Rainfall in February - RCP45 Scenario (Vidra - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click pe harta</sup> (regiunea de interes) pentru actualizare grafic și valori

24

							Search: 2071	
ate ≬	med 🌗	$\min \phi$	max 🌗	an ≬	change_med (	change_max 🌢	change_min 🌢	med_1971_2000
071- 2-28	40.8	4.4	78.8	2071	70.4	229	-81.6	24
2-28					70.4 total entries)	229	-81.6	

Rainfall in February - RCP45 Scenario (Vidra - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

24

							Search: 2100	
date 🌢	med ()	$\min \phi$	max (	an (	change_med	change_max	change_min (	med_1971_2000
2100- 02-28	10	3.4	58.5	2100	-58.2	144.3	-85.8	24

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 3.1.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

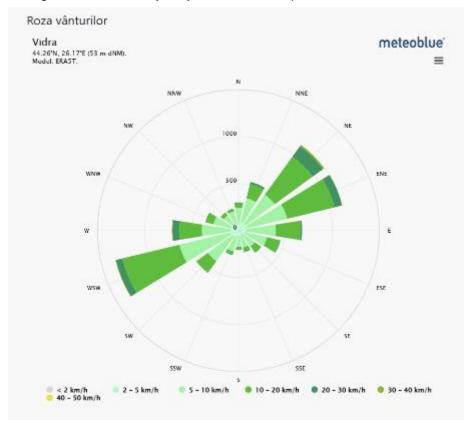


Figure No. 12 - Wind rose

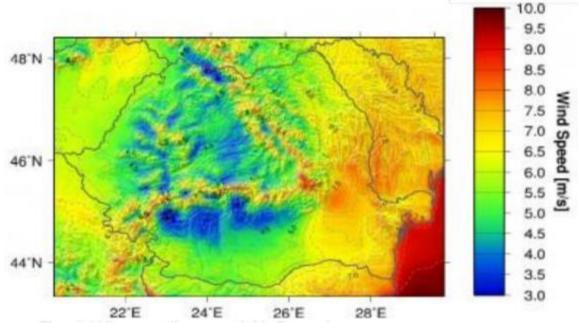


Figure No. 13 - Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

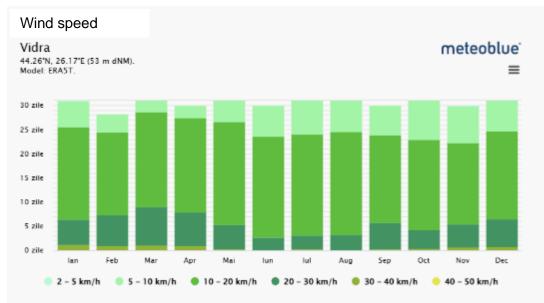
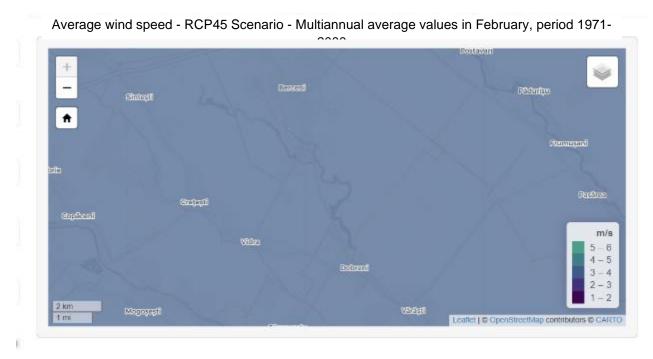


Figure No. 14- The chart for Drânceni shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Vidra - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe harts (regiunes de interes) pentru actualizare grafic și valori

							Search: 20/1	
date ≬	med (	min (	max (	an (	change_med	change_max 🌢	change_min (	med_1971_2000
2071- 02-28	3.2	3	4.2	2071	-0.3	0.7	-0.5	3
showing	1 to 1 of 1	l entries (	filtered fr	om 130	total entries)			_
								ious <mark>1</mark> Next

Show 5	rows +	Сору	CSV	Excel				
							Search: 2100	
date ≬	med (	$\min  \phi$	max ()	an ()	change_med 🌢	change_max 🌢	change_min 🌢	med_1971_2000 (
2100- 02-28	3.3	2.5	4.8	2100	-0.2	1.3	-1	3.5
showing	l to 1 of 1	entries (	filtered fr	om 130	total entries)			vious 1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 3.2 1 Decembrie

#### 3.2.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

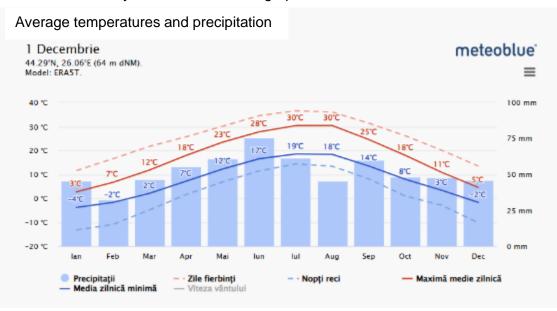
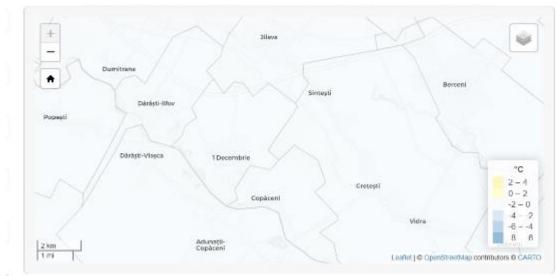


Figure No. 15- Average value of extreme temperatures over the last 30 years at the weather station<sup>2</sup>

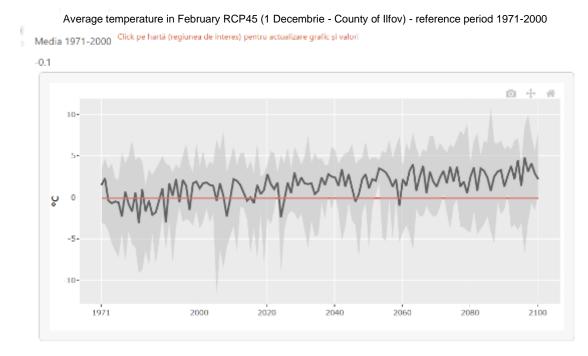
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - Februarv 1971-2000

Figure No. 16 - Average temperature in 1 Decembrie TAU (period 1971 -2000)

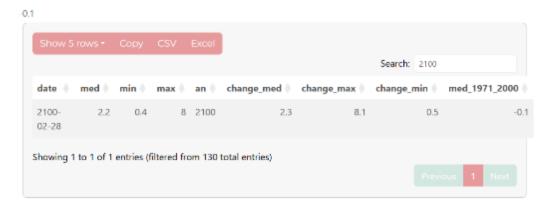
<sup>&</sup>lt;sup>2</sup> Source: www.meteoblue.com



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

				Excel				
							Search: 2071	
late ≬	med ()	$\min  \phi$	max (	an (	change_med	change_max (	change_min	med_1971_2000
2071-	2.4	-1.1	6.5	2071	2.5	6.6	-1	

Average temperature in February RCP45 (1 Decembrie - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

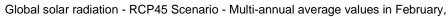
# 3.2.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.8 W/m<sup>2</sup>.





Global solar radiation in February RCP45 (1 Decembrie - County of Ilfov) - reference period 1971-Media 1971-2000 Click pe harts (regiunes de interes) pentru actualizare grafic și valori

103.8



Global solar radiation in February RCP45 (1 Decembrie - County of Ilfov) - reference period 1971-2000 Average value for the period 1971-2000

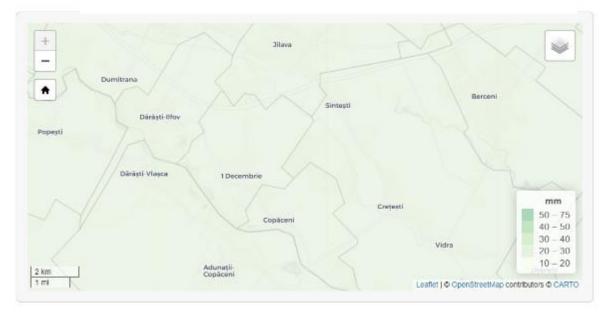
							Search: 2100	)
date ≬	med ≬	min (	max ≬	an ≬	change_med ()	change_max 🌢	change_min (	med_1971_2000
2100-	108	59.2	135.9	2100	4.2	32.1	-44.	6 103

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93.9 W/mp, and at the level of year 2100 it is estimated at 108 W/mp, which is higher than the multiannual average value of 103.8 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is medium.

# 3.2.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.8 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.4 m, and by 2100 it will reach 9 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





Rainfall in February - RCP45 Scenario (1 Decembrie - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

23.8

Show 5	rows <del>-</del>	Сору	CSV	Excel				
							Search: 2071	
date ≬	med $\phi$	min 🕴	max (	an (	change_med 🌢	change_max 🌢	change_min 🌢	med_1971_2000
2071- 02-28	41.4	3.1	80.6	2071	74.2	239.1	-87	23.8
Showing '	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			ious 1 Next

Rainfall in February - RCP45 Scenario (1 Decembrie - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click pe hartă</sup> (regiunea de interes) pentru actualizare grafic și valori

							Search: 2100	
ate ≬	med (	$\min \phi$	max (	an (	change_med	change_max	change_min	med_1971_2000
100-	9	3.4	58.3	2100	-62.1	145.3	-85.7	23.8

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

# 3.2.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

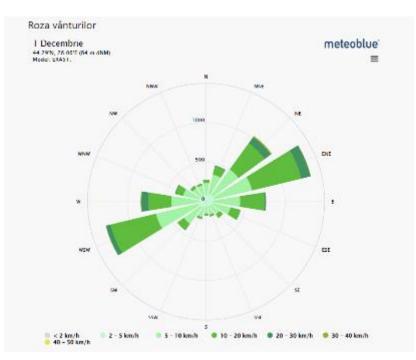


Figure No. 17- Wind rose

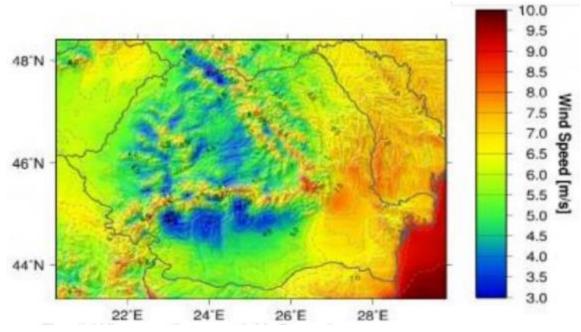


Figure No. 18- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

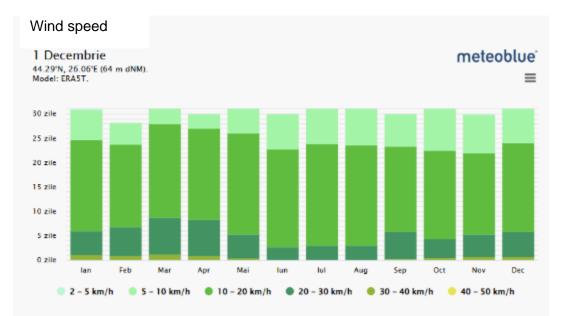


Figure No. 19- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.4 m/s - in February (as shown in the graph below).



Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.2 m/s in 2100, respectively.

Chave F		Family		Fued				
snow 5	rows *	Сору	CSV	Excel			Search: 2071	
late ≬	med ()	min ()	max ()	an ()	change_med	change_max 🕴	change_min (	med_1971_2000
071- 2-28	3.2	2.9	4.2	2071	-0.2	0.B	-0.5	i 3.

Average wind speed in February - RCP45 Scenario (1 Decembrie - County of Ilfov) - reference Media 1971-2000 Click pe hart& (regiunes de interes) pentru actualizare grafic și valori

								Search:	2100	
dat	e (	med (	min (	max (	an (	change_med ()	change_max	change_m	in 🕴 med	1971_2000
210 02-		3.2	2.6	4.7	2100	-0.2	1.3		-0.8	3.4

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 3.3 Copăceni

3

#### 3.3.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

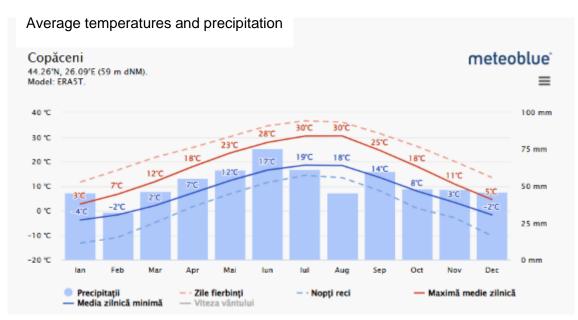


Figure No. 20 - Average value of extreme temperatures over the last 30 years at the weather station<sup>3</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:

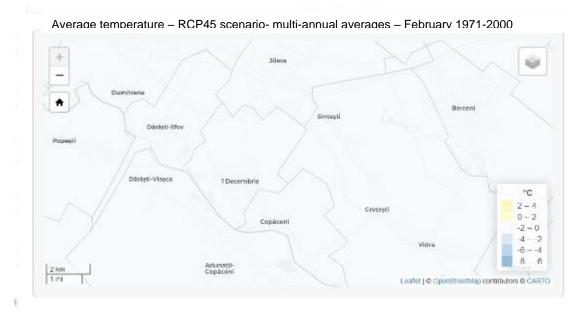
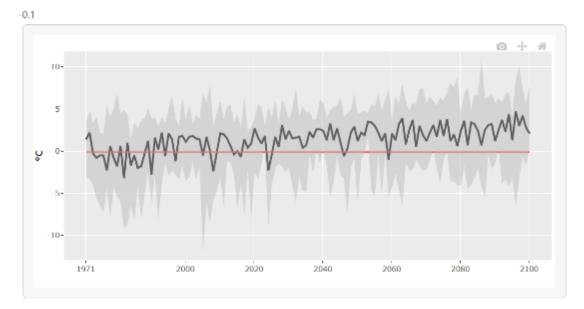


Figure No. 21 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>3</sup> Source: www.meteoblue.com

Average temperature in February RCP45 (Copăceni - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click pe hartă (regiunea de interes)</sup> pentru actualizare grafic și valori



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February RCP45 (Copăceni - County of Ilfov) - reference period 1971-2000

```
Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori
-0.1
                                                                                      Search: 2071
                                                                                                      med 1971 2000
    date
              med
                        min
                                max
                                          an
                                                 change_med
                                                                   change_max 🕘
                                                                                     change_min 🕚
    2071-
                   2.2
                          -1.1
                                     6.5 2071
                                                              23
                                                                                6.6
                                                                                                                      -0.1
    02-28
   Showing 1 to 1 of 1 entries (filtered from 130 total entries)
```

Average temperature in February RCP45 (Copăceni - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (regiunes de interes) pentru actualizare grafic și valori



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

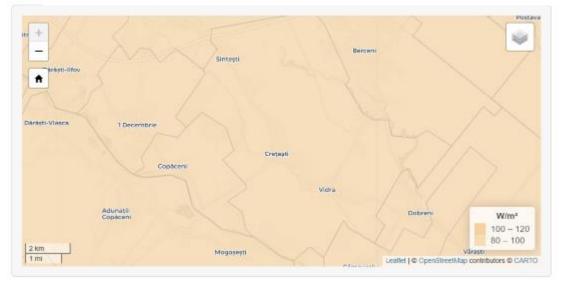
Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

# 3.3.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

With the impact that climate change may have on infrastructure in particular, this factor can have negative effects on the population. In this respect, it is recommended that road/naval infrastructure projects should consider the use of materials that contribute to the reduction of such stress.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.9 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February RCP45 (Copăceni - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click pe hartă (regiunea de interes) pentru actualizare grafic și valori</sup>

103.9



Global solar radiation in February RCP45 (Copăceni - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.9

	rows *			2.001			Search: 2100	
date ≬	med 🌖	min 🕴	max (	an (	change_med	change_max 🌢	change_min	med_1971_2000
2100- 02-15	108.4	58.9	136.2	2100	4.5	32.3	-45	103.9
02-15					total entries)			

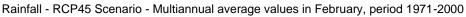
According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.6 W/mp, and at the level of year 2100 it is estimated at 108.4 W/mp, which is higher than the multiannual average value of 103.9 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 3.3.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.0 m, and by 2100 it will reach 10.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





							Search: 2071	
date ()	med $\phi$	$\min \phi$	max ()	an 🕴	change_med ()	change_max 🕴	change_min	med_1971_200
2071- 02-28	41	4.6	78.4	2071	70.3	225.6	-80.9	2

Rainfall in February - RCP45 Scenario (Copăceni - County of Ilfov) - reference period 1971-2000

Rainfall in February - RCP45 Scenario (Copăceni - County of Ilfov) - reference period 1971-2000 Media 1971. 2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 3.3.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

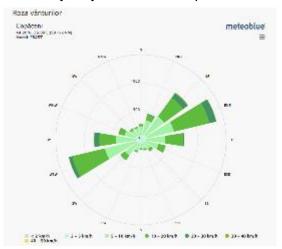


Figure No. 22- Wind rose

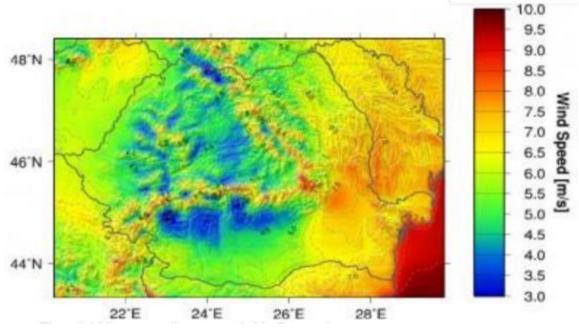


Figure No. 23- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

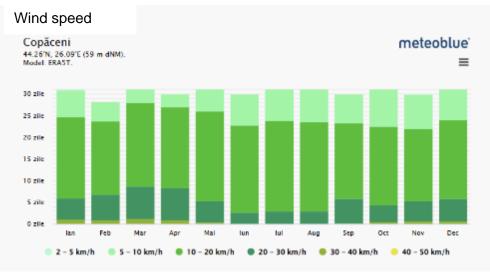


Figure No. 24- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

+	Iline		and a		-
Canalizano Paragaiellar Paragaiellar		Shieji		General	
මොදිසුමණවානය	110 <del>.seanbda</del>				m/s
	Copficent		Angagi Wile		5-6 4-5 3-4 2-3 1-2
2 km 1 mi	Adepatib Replacial		Leaner   © o	OpenStreetMap contri	outors © CARTO

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Copăceni - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Cick pe betă (regimea de interes) pentru actualizare grafic și valori

Show 5	rows*	Conv	CSV	Excel					
011011-0		0000		Exocr			Search: 2	871	
date 0	med ()	min 0	max 0	an ()	change med 0	change max 0	change min	0 med 197	1 2000
2071- 02-28	3.2	3	4.2	2071	-0.3	0.7	-	0.5	3.5
Showing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)			Previous 1	
					o	ceni - County of I			

Show 5 ro	ws -	Сору	CSV	Excel			Search:	2100	
date 🕴 m	ned ≬	min ()	max ()	an (	change_med (	change_max 🕴			1971_2000
2100- 02-28	3.3	2.5	4.8	2100	-0.2	1.3		-1	3.5

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

# 3.4 Dărăști

# 3.4.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

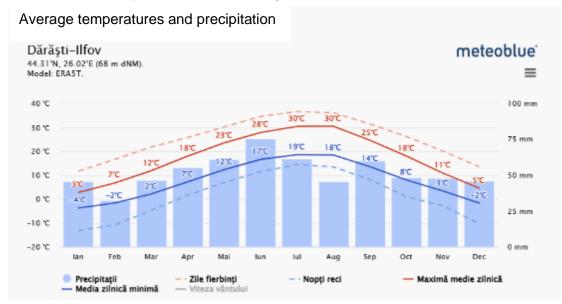
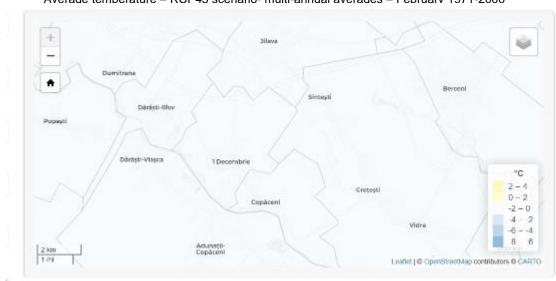


Figure No. 25 - Average value of extreme temperatures over the last 30 years at the weather station<sup>4</sup>

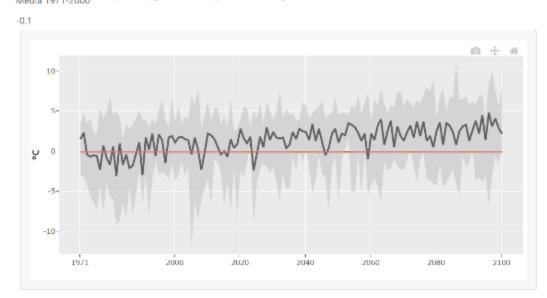
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - Februarv 1971-2000

Figure No. 26 - Average temperature in Dărăști TAU (period 1971 -2000)

<sup>&</sup>lt;sup>4</sup> Source: *www.meteoblue.com* 



Average temperature in February RCP45 (Dărăști - Ilfov - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

# In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February RCP45 (Dărăști - Ilfov - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actuelizare grafic și valori

0.1

	Search: 2071							
med_1971_2000	change_min 🌖	change_max	change_med (	an (	max ()	min (	med ≬	date ≬
-0.	-1	6.6	2.5	2071	6.5	-1.1	2.4	
	-1	6.6	2.5 total entries)					2071- 02-28

Average temperature in February RCP45 (Dărăști - Ilfov - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (reglunca de Interes) pentru actualizare grafic și valori



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

#### 3.4.2 Heat stress

....

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 104.1 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Dărăști - Ilfov - County of Ilfov) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search: 2071	
late ≬	med ≬	min 🕴	max (	an ()	change_med ()	change_max (	change_min	med_1971_2000
2071- 02-15	94.4	68.3	127.3	2071	-9.7	23.2	-35.8	104.1

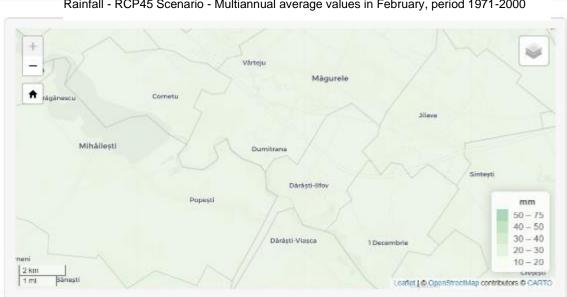


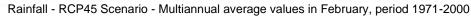
According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 94.4 W/mp, and at the level of year 2100 it is estimated at 107.9 W/mp, which is higher than the multiannual average value of 104.1 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is medium.

#### Heavy rainfall 3.4.3

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.8 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.4 m, and by 2100 it will reach 9 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





Show 5	rows *	Сору	CSV	Excel			Search: 2071	
date 🌗	med ≬	min (	max (	an ≬	change_med ()	change_max 🌖	change_min (	med_1971_2000
2071- 02-28	41.4	3.1	80.6	2071	74.2	239.1	-87	23

Rainfall in February - RCP45 Scenario (Dărăști - Ilfov - County of Ilfov) - reference period 1971-2000

Rainfall in February - RCP45 Scenario (Dărăști - Ilfov - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (regiunea de interes) pentru actualizare grafic și valori

23.8

Show 5	rows •	Сору	CSV	Excel					
							Search:	2100	
date ≬	med $\phi$	min ()	max ≬	an $\phi$	change_med	change_max 🌢	change_n	nin 🔶 n	ned_1971_2000 ()
2100- 02-28	9	3.4	58.3	2100	-62.1	145.3		-85.7	23.8
showing '	1 to 1 of 1	entries (	filtered fr	om 130	total entries)				is 1 Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 3.4.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

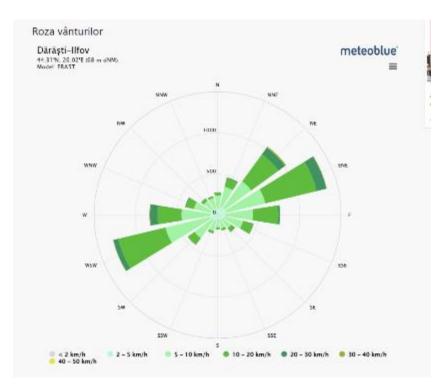


Figure No. 27- Wind rose

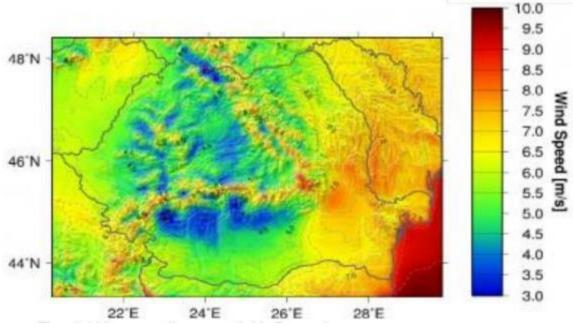


Figure No. 28- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

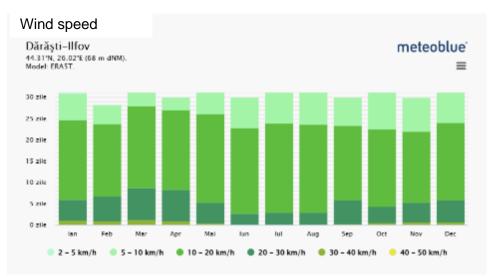


Figure No. 29- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



* -	viajs Sfracio	-
Aplaner Gunda		10aas
10000000	Condinate	
		-Stabey0
Gepapi	18125201000	m/s
	101nfg0401-2m 1110 counded	5 6 4 5 3-4 2-3 1 2
2km mi kmpl	Lea	Aet ( © OpenStreetMap contributors © CARTO

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.2 m/s in 2100, respectively.

Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Average wind speed in February - RCP45 Scenario (Dărăști - Ilfov - County of Ilfov) - reference period 1971-2000

							Search: 207	1
date ≬	med 🕴	min (	max 🌗	an 🕴	change med 🌢	change max 🕴	change min 🕴	med 1971 200
2071- 02-28	3.2	2.9	4.2	2071	-0.3	0.7	-0.6	j

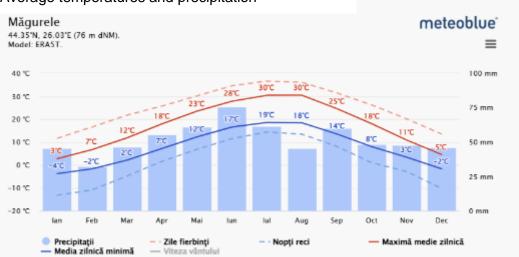
							Search: 2100	
date ≬	med 🌗	min 🕴	max (	an 🔶	change_med ()	change_max 🌢	change_min ()	med_1971_2000
2100- 02-28	3.2	2.6	4.7	2100	-0.3	1.2	-0.9	3.5

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

## 3.5 Măgurele

#### 3.5.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

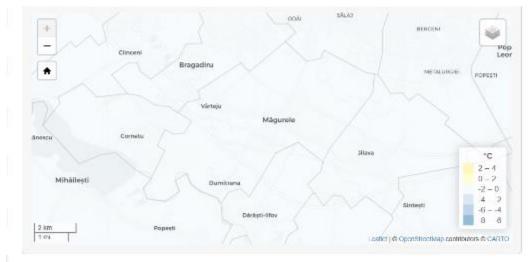


Average temperatures and precipitation

Figure No. 30 - Average value of extreme temperatures over the last 30 years at the weather station<sup>5</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:

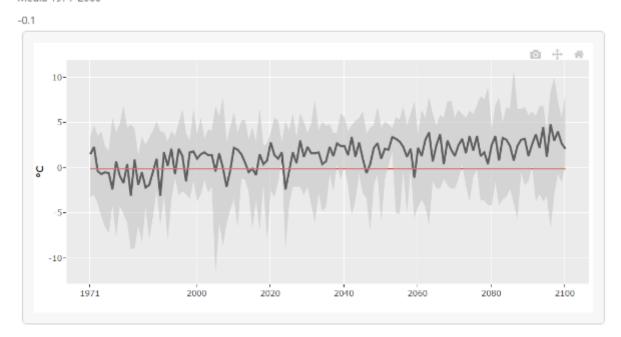
<sup>&</sup>lt;sup>5</sup> Source: *www.meteoblue.com* 



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 31 - Average temperature at TAU level (period 1971 -2000)

Average temperature in February - RCP45 Scenario (Măgurele - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

<b>U</b> .				· ·	Măgurele - Cou	nty of Ilfov) - r	eference period 19
a 1971-2000 Click	pe hartă (re	giunea de i	interes) p	entru actualizare grafic	si valori		
						Search: 2071	
date 🕴 med 🕴	$\min  \phi$	$max \ \phi$	an $\phi$	change med $\boldsymbol{\theta}$	change max $\phi$	change min 🕴	med 1971 2000 (
2071- 2.5 02-28	-1.2	6.4	2071	2.6	6.5	-1.1	-0.1
howing 1 to 1 of 1	entries (f	iltered fre	am 130 i	total entries)			
							ious 1 Next
<b>U</b> .				· · · · · · ·		nty of Ilfov) - r	eference period
<b>.</b> .				P45 Scenario (I		nty of llfov) - r	eference period
<b>U</b> .	t pe hartă (r	egiunea de	interes) p	· · · · · · ·		nty of llfov) - r	eference period
ia 1971-2000 <sup>Cld</sup>	t pe hartă (r	egiunea de	interes) p	· · · · · · ·		nty of llfov) - r Search: 2100	
ia 1971-2000 <sup>Cld</sup>	t pe hartă (r	egiunea de	interes) p Excel	ientru actualizare grafi		Search: 2100	
ia 1971-2000 <sup>Cid</sup> Show 5 rows <del>*</del>	Copy	egiunea de CSV max ()	interes) p Excel	ientru actualizare grafi	c și valori change_max 🕴	Search: 2100	med_1971_2000
ia 1971-2000 <sup>Cld</sup> Show 5 rows • date () med () 2100- 2.1	copy min () 0.4	egiunea de CSV max () 8	Excel	change_med	c și valori change_max 🕴	Search: 2100 change_min	med_1971_2000

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

#### 3.5.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is  $104 \text{ W/m}^2$ .



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Măgurele - County of Ilfov) - reference period 1971-2000

Show 5 ro		Сору		Excel				
							Search: 2071	
date 🔶 r	med ≬	min (	max ≬	an 🔶	change_med	change_max (	change_min (	med_1971_2000
2071- 02-15	95	68.4	127.2	2071	-9	23.2	-35.6	;
nowing 1 t	o 1 of 1	entries (f	iltered fr	om 130 t	otal entries)			
ioning i t		citates (i	incircu in		our eneres)			rious 1 Next
Global so	lar radia	ation in F	ebruary	- RCP45	5 Scenario (Măgu	rele - County of II	fov) - reference	period 1971-2000
	-				pentru actualizare grafi		,	
Media 1971	-2000				h			
104								
Show	5 rows	• Copy	/ CSV	Excel				
							Search: 2100	
date	med	min	max		change_med	change may	change min	
uate			IIIdA	any	change_mea	change_max	change_mm v	med_19/1_2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Showing 1 to 1 of 1 entries (filtered from 130 total entries)

104

02-15

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 95 W/mp, and at the level of year 2100 it is estimated at 107.7 W/mp, which is higher than the multiannual average value of 104 W/mp. We can observe a decreasing

trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 3.5.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.2 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 40.1 m, and by 2100 it will reach 10 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Rainfall in February - RCP45 Scenario (Măgurele - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search: 2071	
date ≬	$med \ \phi$	min 🕴	max ≬	an ()	change_med 🌢	change_max 🌢	change_min 🌢	med_1971_2000
2071- 02-28	40.1	3.6	84.9	2071	73.1	266.5	-84.5	23.

23.2

		Copy						
							Search: 2100	
date ≬	med ()	$\min \phi$	max 🌗	an ≬	change_med	change_max 🌢	change_min 🕴	med_1971_200
2100- 02-28	10	3.3	59.8	2100	-56.8	158.2	-85.8	1

Rainfall in February - RCP45 Scenario (Măgurele - County of Ilfov) - reference period 1971-2000

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 3.5.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

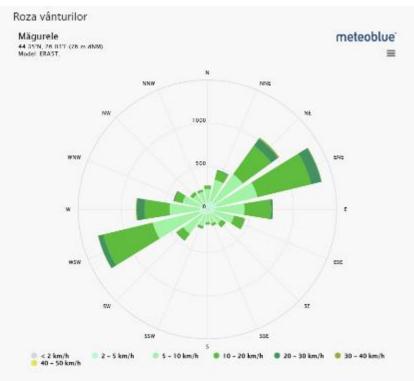


Figure No. 32- Wind rose

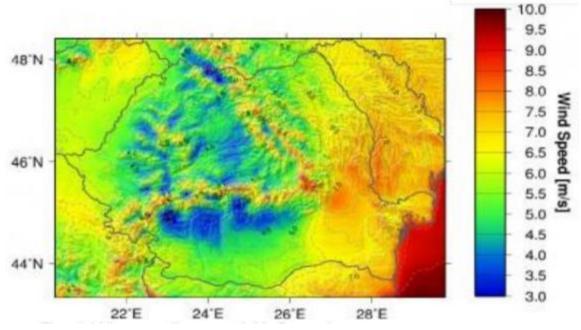


Figure No. 33- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

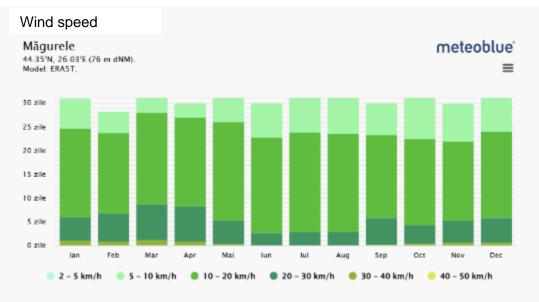


Figure No. 34- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

+	eksi	Der R. P	ar davadan.		
Commagit			කො	80700	0803830
	elizend	Fragacilio			11260113121 1126011312
e		White	Migurala		m/s
Refigherer,	Gancia			alizo	5-6 4-5 3-4 2-3
2 km Miháilesti 1 mi	12	Centran		Leanet   © Op	endireelMap contributors © CARTO

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.1 m/s, and 3.1 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Măgurele - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	rows +	Сору	CSV	Excel				
							Search: 2071	
date ≬	med 🌗	min 🕴	max $\phi$	an (	change_med 🌢	change_max 🌢	change_min 🌢	med_1971_2000
2071- 02-28	3.1	2.8	4	2071	-0.2	0.7	-0.5	3.3
Showing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)			ious 1 Next

Average wind speed in February - RCP45 Scenario (Măgurele - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

3								
Show 5	rows <del>*</del>	Сору	CSV	Excel				
							Search: 2100	
date ≬	med ()	min (	max $\phi$	an (	change_med	change_max 🌢	change_min (	med_1971_2000 (
2100- 02-28	3.1	2.6	4.5	2100	-0.2	1.2	-0.7	3.3
Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			ious <mark>1</mark> Next

In conclusion, in the project area, there is <u>a low risk of exposure</u> of the project to this climatic factor.

## 3.6 Cornetu

## 3.6.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

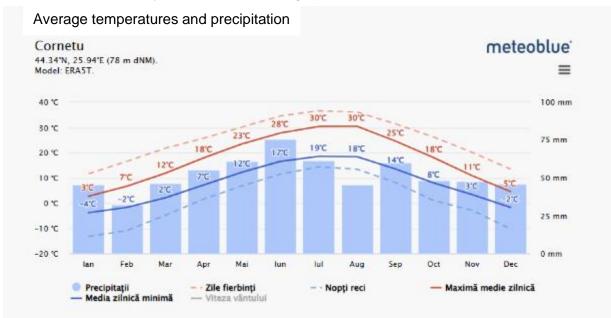


Figure No. 35 - Average value of extreme temperatures over the last 30 years at the weather station<sup>6</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:

Average temperature - RCP45 scenario- multi-annual averages - Februarv 1971-2000

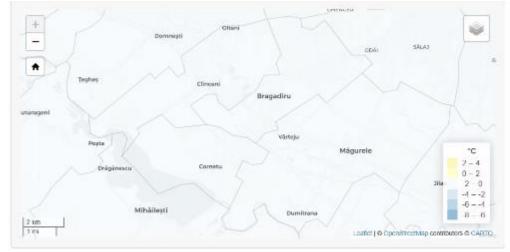
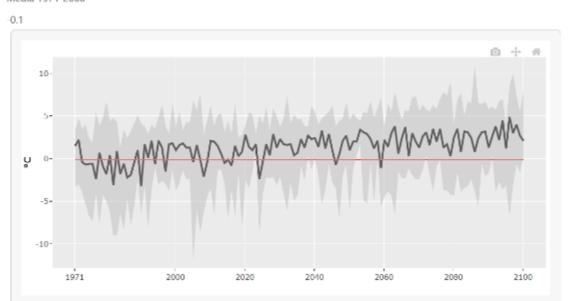


Figure No. 36 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>6</sup> Source: www.meteoblue.com



#### Average temperature in February - RCP45 Scenario (Cornetu - County of Ilfov) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

In 2071 and 2100, respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Cornetu - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	rows *	Сору	CSV	Excel				
							Search: 2071	
late ≬	med	min 🕴	max ()	an 🕴 c	hange_med ≬	change_max ≬	change_min	med_1971_2000
2071- 02-28	2.6	-1.2	6.3	2071	2.7	6.4	-1.1	-0.1
nowing 1	l to 1 of 1	entries (f	iltered fro	om 130 tot	al entries)			ious 1 Next
					CP45 Scenaric centru actualizare grafik		unty of Ilfov) - re	eference period 197 <sup>4</sup>
s	how 5 row	∕s≁ Co	py CS	W Excel			6 J. 199	
							Search: 2100	
da	ate 🖉 me	ed () mi	n 🤍 ma	x ≬ an ≬	change_med (	change_max ()	change_min 🕴	med_1971_2000
	100- 2-28	2.1	0.4	8 2100	2.2	8.1	0.5	-0.1

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above-mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 3.6.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces, or who may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect, it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.9 W/m<sup>2</sup>.

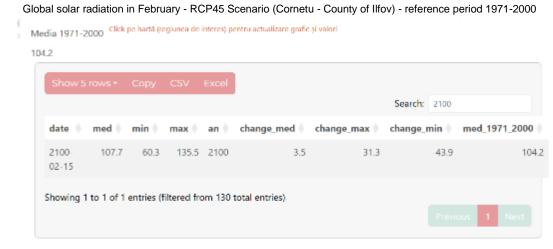
Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000



Global solar radiation in February - RCP45 Scenario (Cornetu - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

	-		-
1	n	4	2
	~		15

Show 5	rows *	Сору	CSV	Excel						
							Search: 2071			
date ≬	med 🌗	min 🕴	max ≬	an ≬	change_med	change_max 🌢	change_min ≬	med_1971_2000 ≬		
2071- 02-15	95.6	68.4	126.3	2071	-8.6	22.1	-35.8	104.2		
Showing 1 to 1 of 1 entries (filtered from 130 total entries) Previous 1 Next										



According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 95.6 W/mp, and at the level of year 2100 it is estimated at 107.7 W/mp, which is higher than the multiannual average value of 104.2 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 3.6.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.4 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 40.6 m, and by 2100 it will reach 10.6 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071, but also for the period 2071-2100.





Rainfall in February - RCP45 Scenario (Cornetu - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search: 2071	
date 🗄	med $\phi$	$\min  \phi$	max $\phi$	an $\phi$	change_med 🔶	change_max ()	change_min (	med_1971_2000
2071- 02-28	40.6	3.9	84.9	2071	73.2	262.1	-83.4	23.4

Rainfall in February - RCP45 Scenario (Cornetu - County of Ilfov) - reference period 1971-2000

Modia 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 23.4 Search: 2100 change\_med | change\_max | change\_min | med\_1971\_2000 ( an 🗄 date | med 🕘 min 🕚 max 🕚 2100--54.8 10.6 3.4 62.8 2100 167.8 -85.5 23.4 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

From the above figures, it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 3.6.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.



Figure No. 37- Wind rose

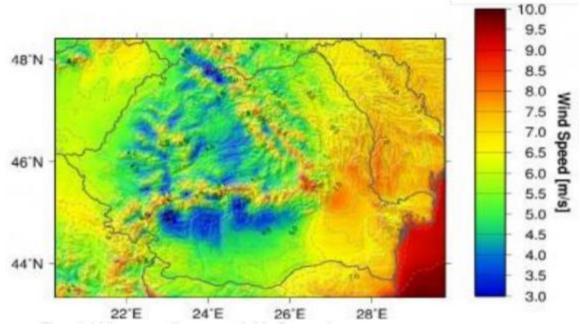


Figure No. 38- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

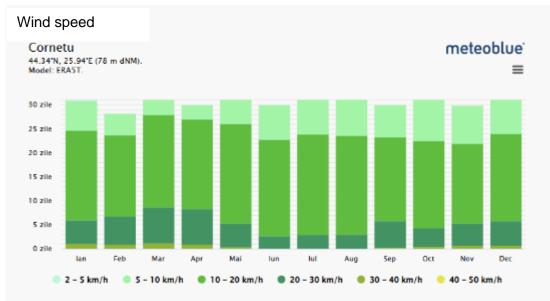
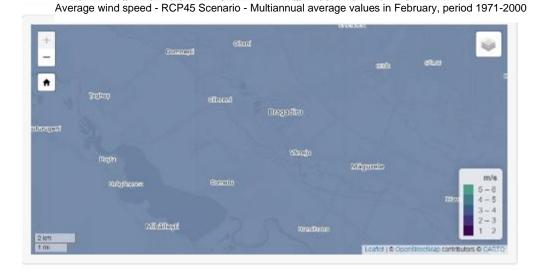


Figure No. 39- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.1 m/s, and 3.1 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Cornetu - Ilfov - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 3.4 Search: 2071 date 🕚 change\_med 🕴 change\_max 🔶 change\_min 🕚 med\_1971\_2000 med min 🕚 max an 🔶 2071 0.3 0.7 0.6 2071 3.4 3.1 2.8 4.1 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Average wind speed in February - RCP45 Scenario (Cornetu - Ilfov - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe harts (regiunes de interes) pertor actualizare grafic și valori

3.4										
	Show 5	rows *	Сору	CSV	Excel					
								Search:	2100	
	date ()	med ()	$\min  \phi$	$max \downarrow$	an $\boldsymbol{\phi}$	$change\_med ~ \emptyset$	change_max (	change_n	nin ( med	1971_2000
	2100- 02-28	3.1	2.7	4.5	2100	-0.3	1.1		-0.7	3.4
	Showing 1	l to 1 of 1	l entries (	filtered fr	om 130	total entries)				1 Next

In conclusion, in the project area, there is <u>a low risk of exposure</u> of the project to this climatic factor.

## 3.7 Cernica

# 3.7.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

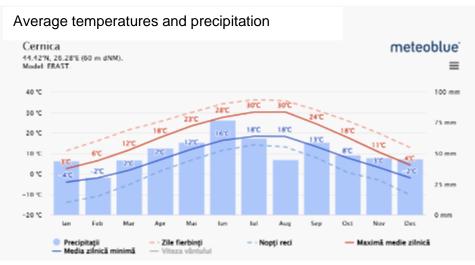


Figure No. 40 - Average value of extreme temperatures over the last 30 years at the weather station<sup>7</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:

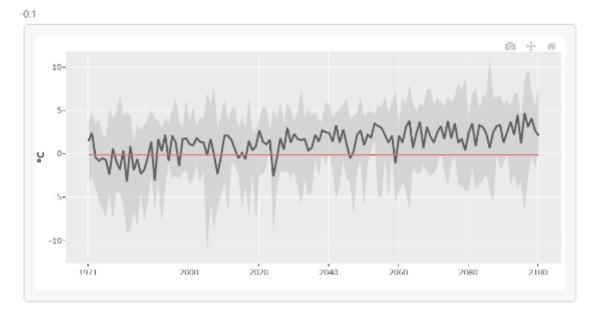


Average temperature - RCP45 scenario- multi-annual averages - Februarv 1971-2000

Figure No. 41 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>7</sup> Source: www.meteoblue.com

Average temperature in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



In 2071 and 2100, respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000

							Search: 2071	
late 💧	med 🌖	$\min \phi$	max (	an 🔶	change_med	change_max 🌢	change_min ≬	med_1971_2000
071- 2-28	2.5	-1.3	6.5	2071	2.6	6.6	-1.2	-0.1

Average temperature in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000

-0.1 Search: 2100 date change\_med | change\_max | change\_min 🔶 med 1971 2000 med 4 min ( max an 2100 2.2 0.4 2.1 0.3 7.9 2100 8 0.1 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

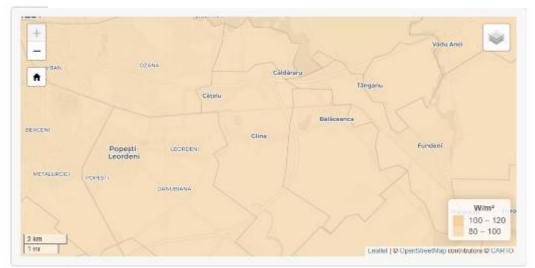
Taking into account the above-mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 3.7.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or who may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect, it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.2 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click pe hartă (regiunea de interes)</sup> pentru actualizare grafic și valori

103.2



Global solar radiation in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.2

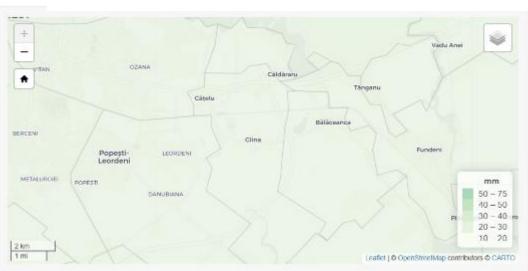
date 💧	med 🌢	min ≬			change med A	change may A	change min A	med 1971 2000
uate	med	min v	max	an	change_med ()	change_max	change_min v	med_1971_2000
2100- 02-15	107.6	59.7	135.5	2100	4.4	32.3	-43.5	103.2

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93.2 W/mp, and at the level of year 2100 it is estimated at 107.6 W/mp, which is higher than the multiannual average value of 103.2 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 3.7.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 21.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 31.6 m, and by 2100 it will reach 9.2 mm. A decreasing trend in precipitation can be observed for the period 2000-2071, but also for the period 2071-2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Rainfall in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click period & interes) pertura cluatizare grafic si valori

21.1	I								
1	Show 5	rows *	Сору	CSV	Excel				
								Search: 2071	
	date 🕴	med ()	min ()	max ()	an ()	change_med	change_max ≬	change_min	med_1971_2000
	2071- 02-28	31.6	4.2	81.2	2071	50.1	285.7	-80.1	21.1
:	Showing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)			
									ious <mark>1</mark> Next

Rainfall in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000

Media 1971-2000 Click pe hantă (regiunea de interes) pentru actualizare grafic și valori

							Search:	2100	
late 🕴	med ≬	min 🕴	max $\oplus$	an (	change_med	change_max (	change_mii	n 🔶 med_	1971_2000
100- 2-28	9.2	2.9	53.2	2100	-56.3	152.7	-8	36.2	21

From the above figures, it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 3.7.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

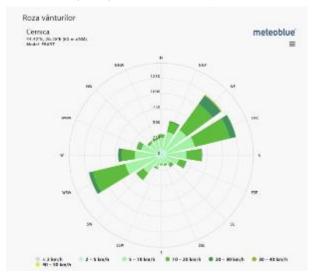


Figure No. 42- Wind rose

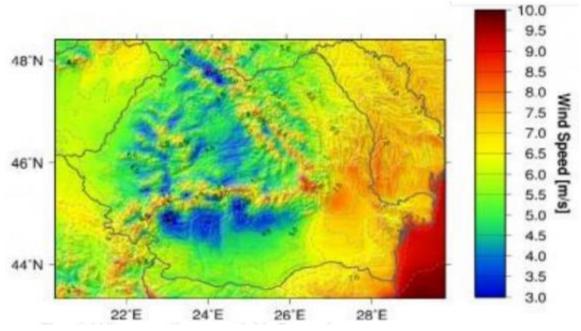


Figure No. 43- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

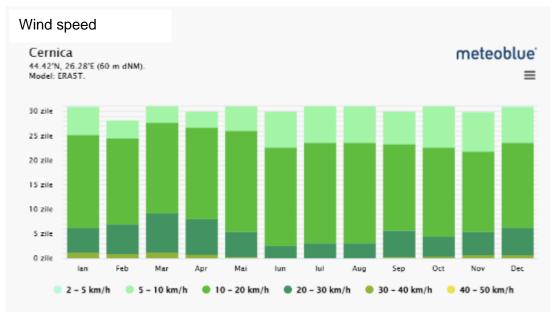


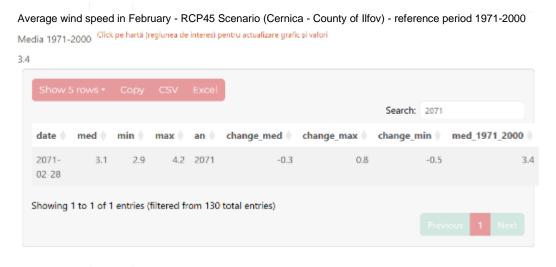
Figure No. 44- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.4 m/s - in February (as shown in the graph below).



Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.1 m/s, and 3.2 m/s in 2100, respectively.



Average wind speed in February - RCP45 Scenario (Cernica - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



In conclusion, in the project area, there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### Glina 3.8

#### 3.8.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

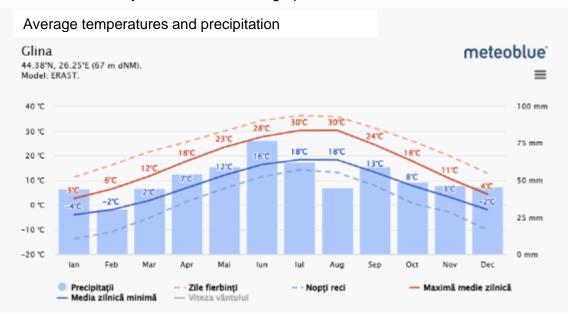
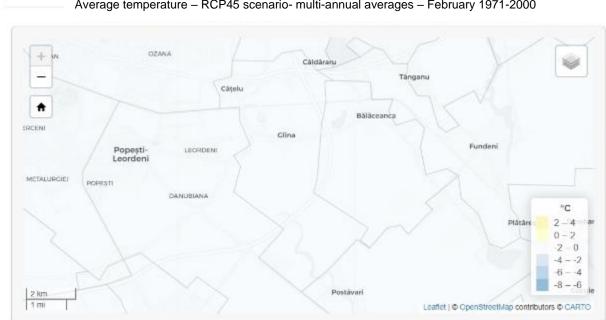


Figure No. 45 - Average value of extreme temperatures over the last 30 years at the weather station<sup>8</sup>

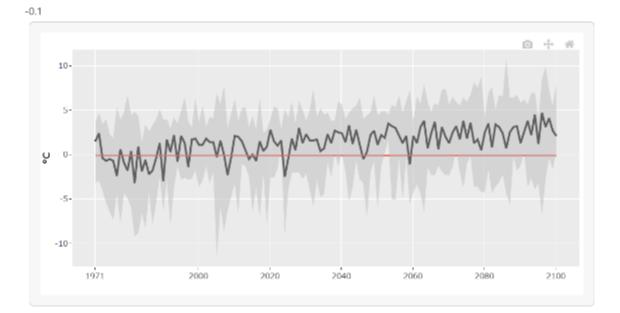
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 46 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>8</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Glina - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe harta (regiunea de interes) pentru actualizare grafic și valori

In 2071 and 2100, respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Glina - County of Ilfov) - reference period 1971-2000

							Search: 2071	
date 🌖	med ≬	min 🕴	max 🌗	an ≬	change med	change max (	change min 🕴	med 1971 2000
2071- 02-28	2.5	-1.3	6.5	2071	2.6	6.6	-1.2	-(

Average temperature in February - RCP45 Scenario (Glina - County of Ilfov) - reference period 1971-2000



Media 1971-2000 Click pe harti (regiunea de interes) pentru actualizare grafic și valori

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above-mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 3.8.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces, or who may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect, it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.2 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Glina - County of Ilfov) - reference period 1971-2000 Media 1971-2000 <sup>Click pe harta</sup> (regiunce de interes) pentru actualizare grafic și valori

03.2								
Show !	5 rows <del>*</del>	Сору	CSV	Excel				
							Search: 2071	
date ≬	med (	min (	max (	an ≬	change_med $\phi$	change_max 🌢	change_min (	med_1971_2000
2071- 02-15	93.1	68.3	128.7	2071	-10.1	25.5	-34.9	103.2
Showing	1 to 1 of 1	entries (f	iltered fr	om 130	total entries)			ious 1 Next
								INCAS I NEX

Show 5	i rows +	Сору	CSV	Excel				
							Search: 2100	
date ≬	med ()	$\min  \phi$	max $\phi$	an (	change_med	change_max 🌖	change_min 🌢	med_1971_2000
2100- 02-15	107.5	59.5	135.5	2100	4.3	32.3	-43.7	103.2

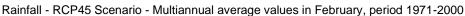
According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93.1 W/mp, and at the level of year 2100 it is estimated at 107.5 W/mp, which is higher than the multiannual average value of 103.2 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is medium.

## 3.8.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 21.6 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 34.3 m, and by 2100 it will reach 9.3 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





								reference pe	eriod 1971-2000
Me	dia 1971-	2000 <sup>Clid</sup>	k pe hartă ()	egiunea de	interes) p	entru actualizare grafi	c și valori		
21.	6								
	Show §	5 rows <del>*</del>	Сору	CSV	Excel				
								Search: 2071	
	date 🕴	$med \ \emptyset$	min (	max ()	an $\phi$	change_med	change_max ()	change_min 🕴	med_1971_2000
	2071- 02-28	34.3	3.9	80.9	2071	58.6	274.2	-82	21.6
	Showing	1 to 1 of 1	1 entries (	filtered fr	rom 130	total entries)			ious 1 Next
	dia 1971-					rio (Glina - Co entru actualizare grafi		- reference pe	eriod 1971-2000
ſ									
	Show 8	5 rows *	Сору	CSV	Excel				
								Search: 2100	
	date ≬	med 🕴	min 🕴	max ≬	an ()	change med 🌢	change max 🕚	change min ≬	med 1971 2000 🕚
	2100- 02-28	9.3	3.1	54.3	2100	-57	151.2	-85.7	21.6

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

Showing 1 to 1 of 1 entries (filtered from 130 total entries)

#### 3.8.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

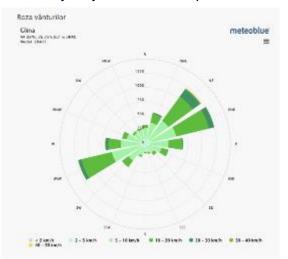


Figure No. 47- Wind rose

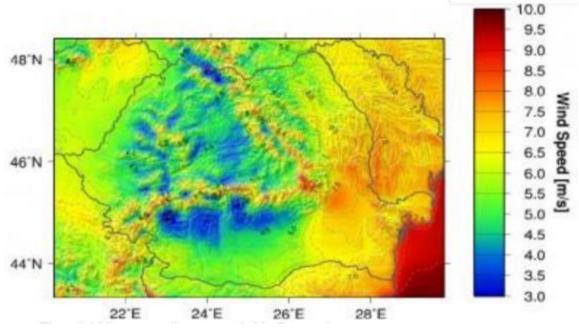


Figure No. 48- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

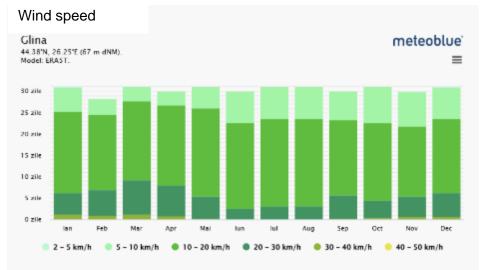


Figure No. 49- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

+ 8	6569	27	CALCO		
-		etçak		18ngerado	
<b>†</b>				Gillensen	
****	Capasil- Lenselari	10030007	elieo		Rodal
621/33/80 <sub>PR</sub>	71908				
		0000100000			
					m/s m/s
					5-8 4-5
					3 4
					2-3

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.1 m/s, and 3.3 m/s in 2100, respectively.

Show 5 r					entru actualizare grafi			
31104731	0.02	Copy		Excer			Search: 2071	
date 🕴 🛛 r	ned ≬	min +	max $\phi$	an 🔶	change_med	change_max $\phi$	change_min $\phi$	med_1971_2000
2071- 02-28	3.1	2.8	4.1	2071	-0.3	0.7	-0.6	3.4
	to 1 of 1	entries (	filtered fr	om 130	total entries)			rious 1 Next

Average wind speed in February - RCP45 Scenario (Glina - County of Ilfov) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.4										
	Show 5	rows +	Сору	CSV	Excel					
								Search: 2	100	
	date $\phi$	med (	$\min  \phi$	$max \downarrow$	$an \downarrow$	change_med 🌢	change_max	change_mii	n 🕴 med_19	971_2000 (
	2100- 02-28	3.2	2.5	4.6	2100	-0.2	1.2		0.9	3.4
1	Showing 1	1 to 1 of 1	entries (	filtered fr	om 130	total entries)				
									Previous 1	Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

# 4 Călărași County

## 4.1 Budești

## 4.1.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

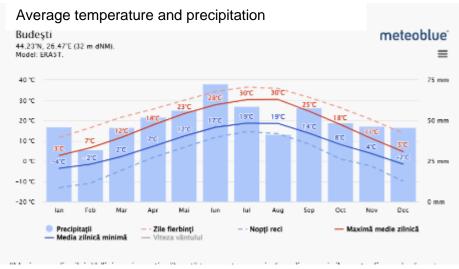


Figure No. 50 - Average value of extreme temperatures over the last 30 years at the weather station<sup>9</sup>

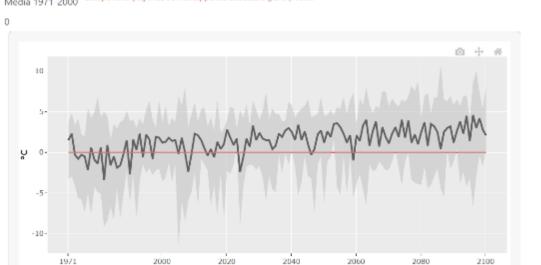
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0°C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 51 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>9</sup> Source: *www.meteoblue.com* 



Average temperature in February - RCP45 Scenario (Budești - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Budesti - County of Călărasi) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

2080

2100

							Search: 2071	
late 🕕 n	ned ()	min (	max (	an (	change med (	change max 0	change min (	med 1971 2000
071- 2-28	2.3	-1.1	6.6	2071	2.3	6.6	-1.1	0

Average temperature in February - RCP45 Scenario (Budești - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	rows *	Сору	CSV	Excel					
							Search: 2100		
date	med ()	min ()	max (	an (	change_med $\phi$	change_max $\phi$	change_min	med_1971_200	<b>o</b> +
2100- 02-28	2.1	0.4	8	2100	2.1	8	0.4		0
Showing 1	1 to 1 of 1	entries (f	iltered fr	om 1301	total entries)				
								ious 1 Next	

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the risk of the project being affected by the positive temperature variation in the next period is medium.

## 4.1.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.4 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Budești - County of Călărași) - reference period 1971-2000

103.4

Show 5	rows +	Сору	CSV	Excel				
							Search: 2071	
date ≬	med ≬	min 🕴	max ()	an ()	change_med	change_max 🌢	change_min 🌢	med_1971_2000 (
2071- 02-15	92.9	67.8	129.2	2071	-10.5	25.8	-35.6	103.4
showing 1	to 1 of 1	entries (f	iltered fro	om 130 (	total entries)			ous 1 Next

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Global solar radiation in February - RCP45 Scenario (Budești - County of Călărași) - reference period 1971-2000 Media 1971-2000 <sup>Click pe hartă (regiunea de interes) pentru actualizare grafic și valori</sup>

103.4

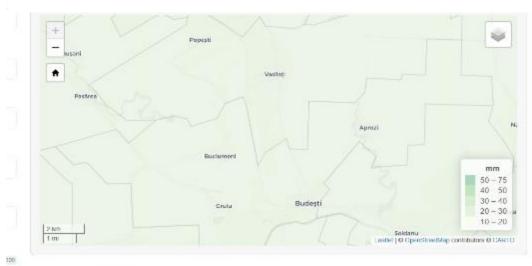
Show 5	10005	сору	CSV	Excer			Search: 2100	
date ≬	med (	min (	max (	an (	change_med (	change_max (	change_min 🌖	med_1971_2000
2100- 02-15	108.1	59.6	135.9	2100	4.7	32.5	-43.8	103.4
showing 1	to 1 of 1	entries (f	iltered fro	om 130 f	total entries)			ous 1 Next

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.9 W/mp, and at the level of year 2100 it is estimated at 108.1 W/mp, which is higher than the multiannual average value of 103.4 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.1.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 29.1 m, and by 2100 it will reach 10.3 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

					·		Search: 2071	
date ≬	med ()	min ()	max ()	an ()	change_med	change_max (	change_min	med_1971_200
2071- 02-28	29.1	6	72.3	2071	32.4	228.9	-72.7	
				120	total antrine)			
showing	1 to 1 of 1	entries (f	litered fr	'om 130	iotal entries)			vious <mark>1</mark> Next
Rainfal	l in Febru	ary - RC	:P45 Sc	cenario		nty of Călărași) fi: și valori		
Rainfal Media 11	l in Febru	ary - RC lick pe herit	:P45 So (regiunea	cenario de interes;	(Budești - Cou pentru actualizare gra	. ,,		
Rainfal Media 11	l in Febru 971-2000	ary - RC lick pe herit	:P45 So (regiunea	cenario de interes;	(Budești - Cou pentru actualizare gra	. ,,		
Rainfal Media 11 22	in Febru 971-2000 <sup>C</sup> ow 5 rows	ary - RC lick pe herts • Copy	:P45 Sc (regunea / CSV	cenario de interes; Excol	(Budești - Cou pentru actualizare gra	. ,,	- reference per Search: 2100	iod 1971-2000

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

### 4.1.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

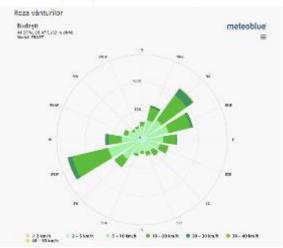


Figure No. 52- Wind rose

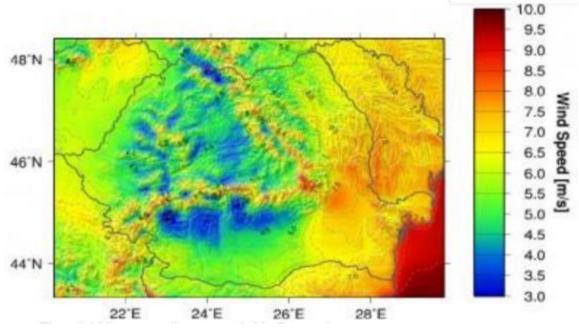


Figure No. 53- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

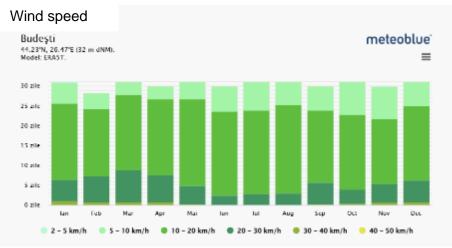


Figure No. 54- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

Paranti

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Budești - County of Călărași) - reference period 1971-2000

Show 5	rows *	Сору	CSV	Excel				
							Search: 2071	
date ≬	med (	min 🕴	max 🌗	an 🔶	change med 🌗	change max 🌢	change min 🌢	med 1971 2000
2071- 02-28	3.3	3.1	4.4	2071	-0.3	0.8	-0.5	:

Average wind speed in February - RCP45 Scenario (Budești - County of Călărași) - reference period 1971-2000

Modia 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.6										
	Show 5	rows *	Сору	CSV	Excel			Search:	2100	
	date 🌗	med ()	$\min \phi$	max ()	an $\phi$	change_med ()	change_max (	change_n	nin≬ me	d_1971_2000 (
	2100- 02-28	3.4	2.5	4.9	2100	-0.2	1.3		-1.1	3.6
:	Showing 1	to 1 of 1	entries (	filtered fr	om 130	total entries)				1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### Chirnogi 4.2

#### Temperature variability 4.2.1

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

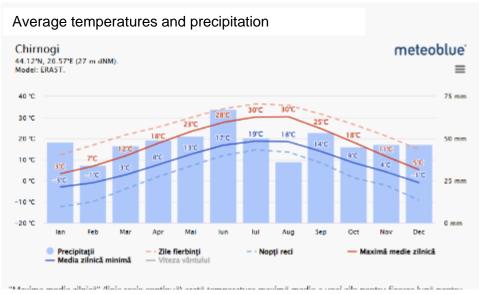
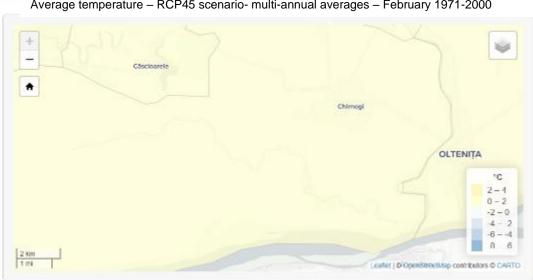


Figure No. 55 - Average value of extreme temperatures over the last 30 years at the weather station<sup>10</sup>

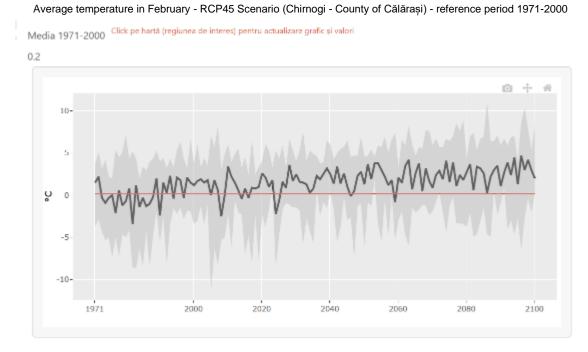
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0.2 °C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 56 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>10</sup> Source: www.meteoblue.com



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

show 5 rows +	Сору	CSV I	Excel					
						Search: 2071	1	
ate 🕴 med 🤅	min (	max (	an (	change_med	change max	change_min	med_1971_200	0 0
271- 2.4 2-28	-0.8	6.7	2071	2.	2 6.5	-	1	0.2
owing 1 to 1 of	1 entries (i	iltered fro	m 130 t	total entries)			_	
					ırio (Chirnogi - C		vious 1 Next ași) - reference	period 197
Average terr 1971-2000	operature	in Febru giunes de in	iary - F lecej pe		, c			Deriod 197
Ū	operature	in Febru	iary - F lecej pe	RCP45 Scena	, c	county of Călăr	ași) - reference	beriod 197 <sup>.</sup>
Average terr 1971-2000 <sup>Clife</sup>	operature pe bată (re Copy	in Febru giures de in CSV E	lary - F Isrei pe Skoel	RCP45 Scena	fir și voltri	Search: 2100	ași) - reference	
Average terr 1971-2000	operature pe bată (re Copy	in Febru giures de in CSV E	lary - F Isrei pe Skoel	RCP45 Scena	fir și voltri	Search: 2100	ași) - reference	

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 4.2.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.6 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Chirnogi - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori 103.6

Show 5	rows *	Сору	CSV	Excel				
							Search: 2071	
date ≬	med $\phi$	min 🕴	max $\phi$	an ()	change_med $\phi$	change_max 🌢	change_min ≬	med_1971_2000 (
2071- 02-15	92	67.6	131.8	2071	-11.5	28.3	-36	103.6
Showing 1	to 1 of 1	entries (f	iltered fro	om 130 f	total entries)			ous <mark>1</mark> Next

#### Global solar radiation in February - RCP45 Scenario (Chirnogi - County of Călărași) - reference period 1971-2000

SHOW 5	i rows *	Сору	CSV	Excel			Search: 2100	
date ≬	med 🌢	min (	max ()	an (	change_med	change_max	change_min	med_1971_2000
2100- 02-15	108.6	57.6	136.3	2100	5	32.8	-45.9	10

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.0 W/mp, and at the level of year 2100 it is estimated at 108.6 W/mp, which is higher than the multiannual average value of 103.6 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

#### 4.2.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 22.7 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 28.6 mm, and by 2100 it will reach 13.4 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Show !	5 rows *	Сору	CSV	Excel				
							Search: 2071	
date ()	$med \ \emptyset$	$\min \phi$	$max \downarrow$	an $\phi$	change_med	change_max (	change_min (	med_1971_2000
2071- 02-28	28.6	10.1	64.1	2071	26.1	182.6	-55.5	22

Rainfall in February - RCP45 Scenario (Chirnogi - County of Călărași) - reference period 1971-2000

Rainfall in February - RCP45 Scenario (Chirnogi - County of Călărași) - reference period 1971-2000

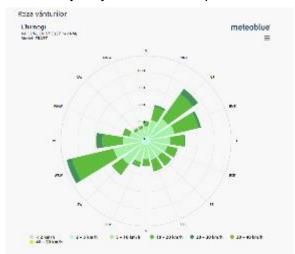
Media 1971-2000 Click pe hartă (reglunea de Interes) pentru actualizare grafic și valori



From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.2.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.



#### Figure No. 57- Wind rose

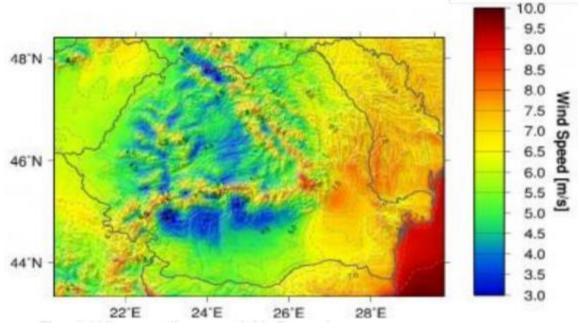


Figure No. 58 - Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

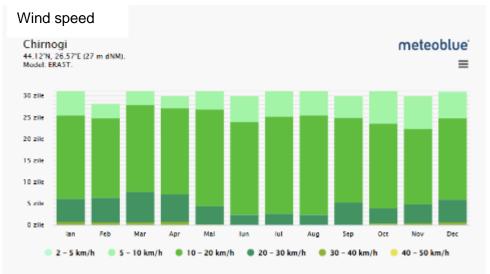
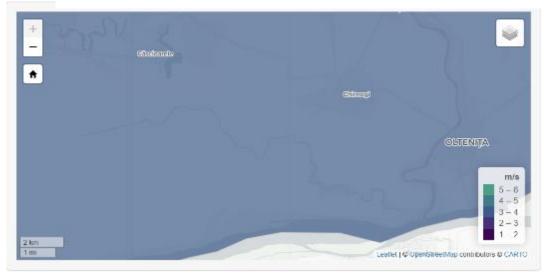


Figure No. 59- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.4 m/s, and 3.6 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Chirnogi - County of Călărași) - reference period 1971-2000

Show !	5 rows <del>*</del>	Сору	CSV	Excel			Search: 2071	
date ≬	med 🌢	min (	max ≬	an 🔶	change_med	change_max ≬		med_1971_2000
2071- 02-28	3.4	3.1	4.5	2071	-0.3	0.8	-0.6	:

Average wind speed in February - RCP45 Scenario (Chirnogi - County of Călărași) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.7									
	Show 5	i rows •	Сору	CSV	Excel				
								Search: 2100	
	date ≬	med ()	min 🕴	max ()	an $\phi$	change_med	change_max 🌢	change_min 🌢	med_1971_2000
	2100- 02-28	3.6	2.4	5.1	2100	-0.1	1.4	-1.3	3.7
4	Showing	1 to 1 of 1	l entries (	filtered fr	om 130	total entries)			ious 1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

# 4.3 Crivăț

### 4.3.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.



Average temperatures and precipitation

Figure No. 60 - Average value of extreme temperatures over the last 30 years at the weather station<sup>11</sup>

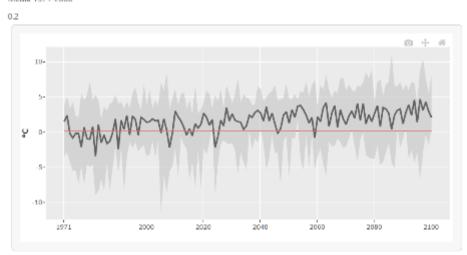
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0.2 °C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 61 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>11</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Crivăț - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valor

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Crivăț - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 0.2 Search: 2071 med\_1971\_2000 date change med change max change min 0 med min max an 2071-23 -0.9 68 2071 2.1 6.6 -1.10.2 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Average temperature in February - RCP45 Scenario (Crivăț - County of Călărași) - reference period 1971-2000



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

### 4.3.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.6 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Crivăț - County of Călărași) - reference period 1971-2000 Media 1971-2000 <sup>Click pe hartă (regiunea de interes)</sup> pentru actualizare grafic și valori

103.6

			Excel			Search: 207	1
med 🌢	min (	max 🌢	an (	change_med ≬	change_max 🌢	change_min	med_1971_2000
92.5	66.8	130.4	2071	-11	26.9	-36.	8 103.
					26.9	-36.	8 1
	92.5	92.5 66.8	92.5 66.8 130.4	92.5 66.8 130.4 2071		92.5 66.8 130.4 2071 -11 26.9	92.5 66.8 130.4 2071 -11 26.9 -36.

Show 5	rows -	Сору	CSV	Excel				
							Search: 2100	
date ≬	med $\phi$	$\min \phi$	max (	an (	change_med	change_max	change_min (	med_1971_2000
2100- 02-15	108.5	59.4	136.1	2100	5	32.5	-44.1	103

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.6 W/mp, and at the level of year 2100 it is estimated at 108.4 W/mp, which is higher than the multiannual average value of 103.9 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.3.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 28.5 m, and by 2100 it will reach 11.6 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

	Click	oe hartă (r			entru actualizare graf	• • • • •	·	eriod 1971-200	
Media 1971-	2000								
22.5									
Show 5	5 rows +	Сору	CSV	Excel					
							Search:	2071	
date ≬	med ()	min 🕴	max $\phi$	an ()	change_med	change_max (	change_mi	n 🕴 med_197	1_2000
2071- 02-28	28.5	8.3	69.6	2071	26.5	208.9	-4	53.2	2
								Previous 1	
Rai	nfall in Fe	ebruary -	- RCP45	5 Scena	ario (Crivăț - Cou	unty of Călărași)	- reference	period 1971-2	000
Rai	~	-			ario (Crivăț - Cou	unty of Călărași) și velori	- reference	period 1971-2	000
	~	-			. ,		- reference	period 1971-2	000
Media 197 22.5	1-2000 <sup>Cliv</sup>	ŝ pe hartă (	regiunea de	interes) p	. ,		- reference	period 1971-2	000
Media 197 22.5	~	ŝ pe hartă (	regiunea de	interes) p	. ,				000
Media 197 22.5	1-2000 <sup>Cliv</sup>	ŝ pe hartă (	regiunea de	interes) p	. ,		- reference Search: 210		000
Media 197 22.5	1-2000 <sup>Cir</sup> v 5 rows *	k pehată ( Copy	regiunea de	interes) p Excel	entru actuelizare grafic		Search: 210	0	
Media 197 22.5 Show	1-2000 <sup>Cir</sup> v 5 rows *	k pehetä ( Copy min ()	CSV max ()	interes) p Excel	entru actuelizare grafic	și valori	Search: 210	0 med 1971 2	

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.3.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

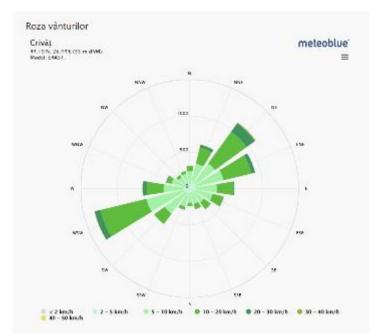


Figure No. 62- Wind rose

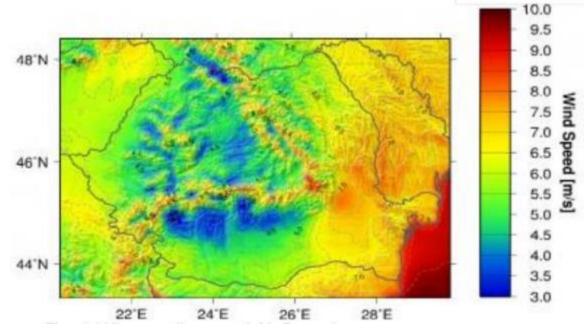


Figure No. 63- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

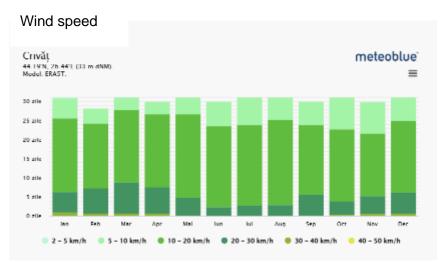


Figure No. 64- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.6 m/s - in February (as shown in the graph below).

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.4 m/s in 2100, respectively.

#### Average wind speed in February - RCP45 Scenario (Crivăț - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

Show 5	rows *	Сору	CSV	Excel			Search:	2071	
date 🌖	med (	min (	max (	an (	change_med	change_max (	change_n	nin 🕴 med_	1971_2000 (
2071- 02-28	3.2	3.1	4.4	2071	-0.4	0.8		-0.5	3.6
Showing 1	to 1 of 1	entries (	filtered fr	om 130	total entries)			Previous	1 Next

Average wind speed in February - RCP45 Scenario (Crivăț - County of Călărași) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (reglunea de interes) pentru actualizare grafic și valori

3.6										
	Show 5	rows <del>-</del>	Сору	CSV	Excel					
								Search:	2100	
	date ≬	med ≬	$\min \phi$	max (	an $\phi$	change_med	change_max 🌢	change_m	nin 🕴 med	1971_2000 (
	2100- 02-28	3.4	2.4	4.9	2100	-0.2	1.3		-1.2	3.6
	Showing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)			Previous	1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 4.4 Curcani

#### 4.4.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

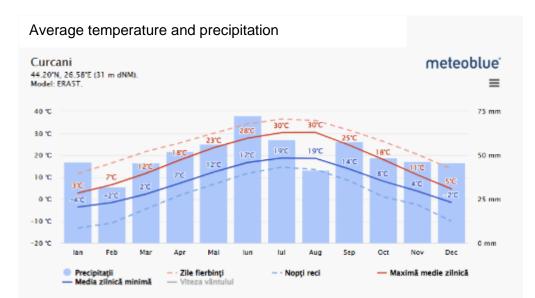


Figure No. 65 - Average value of extreme temperatures over the last 30 years at the weather station<sup>12</sup>

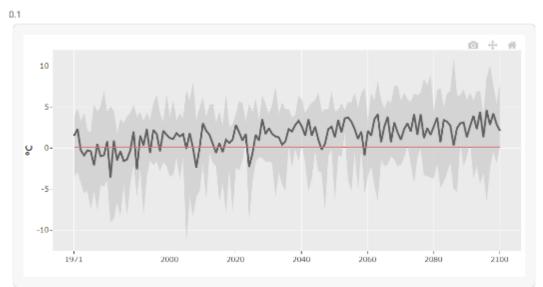
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 66 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>12</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Curcani - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Curcani - County of Călărași) - reference period 1971-2000

		Сору						
							Search: 2071	
date 🔶	med (	min (	max $\phi$	an ≬	change_med 🌢	change_max ≬	change_min ≬	med_1971_2000
2071- 02-28	2.3	-1.1	6.7	2071	2.2	6.6	-1.2	

Average temperature in February - RCP45 Scenario (Curcani - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

0.1

Show 5	rows *	Сору	CSV	Excel				
							Search: 2100	
date 💧	med 🌗	min 🕴	max ≬	an ≬	change_med	change_max 🌢	change_min (	med_1971_2000
2100- 02-28	2.1	0.3	7.9	2100	2	7.8	0.2	0.1
howing 1	to 1 of 1	entries (f	iltered fr	om 130 f	total entries)			

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

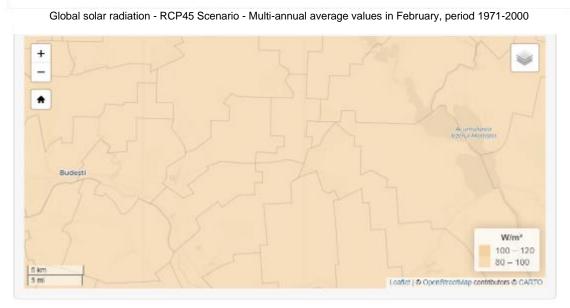
#### 4.4.2 Heat stress

103.2

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.2 W/m<sup>2</sup>.



Global solar radiation in February - RCP45 Scenario (Curcani - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	rows *	Сору	CSV	Excel				
							Search: 2071	
date ≬	med $ ightarrow$	$\min  \emptyset$	max $\phi$	$\mathbf{an} \ \phi$	change_med	change_max 🌢	change_min	med_1971_2000
2071- 02-15	92.9	67.4	128.6	2071	-10.2	25.4	-35.8	103.2
howing 1	to 1 of 1	entries (f	iltered fro	om 130 f	total entries)			ious 1 Next

		Сору						
							Search: 2100	
ate 💧	med ()	min 🕴	max (	an 🔶	change_med	change_max	change_min	med_1971_2000
100- 2-15	108.1	58.9	135.7	2100	4.9	32.5	-44.3	103

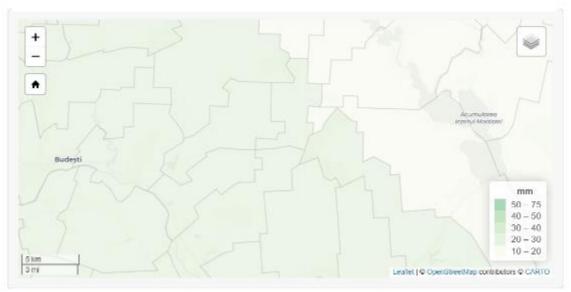
Global solar radiation in February - RCP45 Scenario (Curcani - County of Călărași) - reference period 1971-2000

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.9 W/mp, and at the level of year 2100 it is estimated at 108.1 W/mp, which is higher than the multiannual average value of 103.2 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is medium.

# 4.4.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 21.2 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 25.0 m, and by 2100 it will reach 12.7 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Rai	infall in Fe	ebruary -	RCP45	Scenari	io (Curcani - Cou	nty of Călărași) -	reference perio	od 1971-2000	
Media 1971	-2000 <sup>Clic</sup>	k pe hartă (	regiunea de	interes) p	pentru actualizare grafic	și valori			
21.2									
Show	5 rows <del>*</del>	Сору	CSV	Excel			Search: 2071	1	
date	med ≬	min 🕴	max (	an ≬	change_med	change_max (	change_min (	med_1971_2000	ŀ.
2071- 02-28	25	8.7	69.8	2071	18.1	229.8	-58.9	21.	2
Showing	1 to 1 of	1 entries	(filtered fr	rom 130	total entries)			vious 1 Next	
Rai Media 1971-7 21.2		-			io (Curcani - Cou entru actualizare grafi	. , .	reference perio	od 1971-2000	
Show 5	i rows *	Сору	CSV	Excel			Search: 210	00	
date	med 💧	min 🌢	max ≬	an ≬	change med	change max 🌢	change min	med 1971 2000	. (
2100-	12.7	3.4		2100	-40	116.9			
02-28									1.2

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.4.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

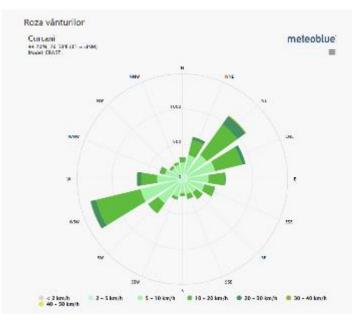


Figure No. 67- Wind rose

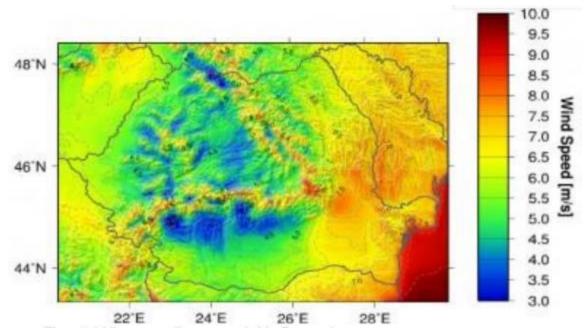


Figure No. 68- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

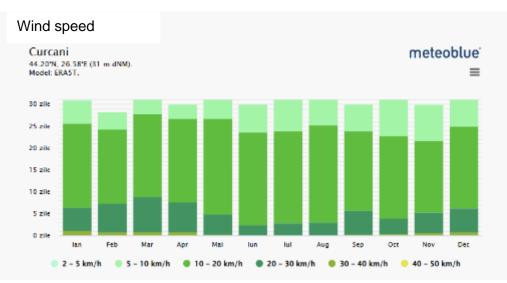
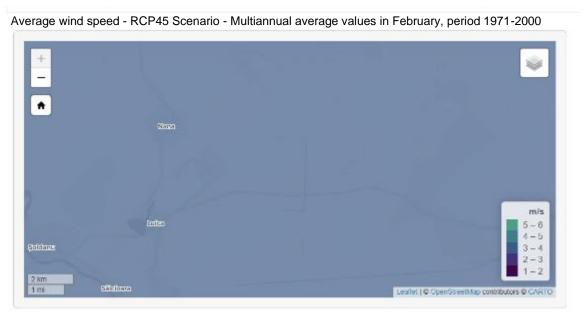
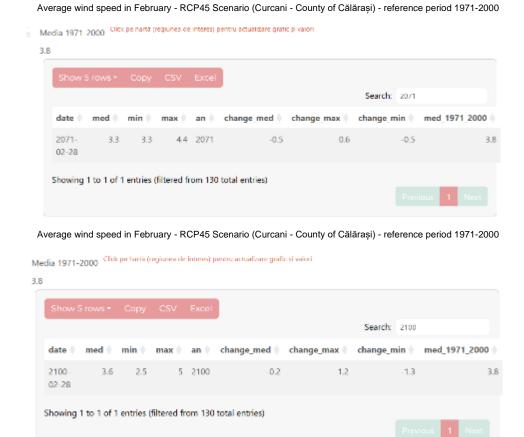


Figure No. 69- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.3 m/s, and 3.6 m/s in 2100, respectively.



In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

### 4.5 Frumuşani

#### 4.5.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

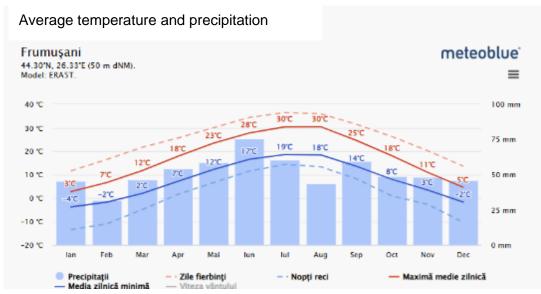


Figure No. 70 - Average value of extreme temperatures over the last 30 years at the weather station<sup>13</sup>

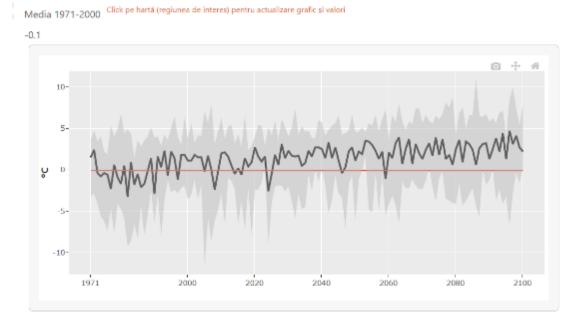
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 71 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>13</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Frumuşani - County of Călărași) - reference period 1971-2000

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Frumuşani - County of Călărași) - reference period 1971-2000

```
Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori
```

-0.1

Show 5 r	ows <del>-</del>	Сору	CSV	Excel			Course and	
							Search: 2071	
date 💧	med ≬	min 🌗	max ≬	an ≬	change_med 🌢	change_max 🌢	change_min 🌢	med_1971_2000 🌢
2071- 02-28	2.4	-1.3	6.6	2071	2.5	6.7	-1.2	-0.1
howing 1	to 1 of 1	entries (f	iltered fr	om 130 f	total entries)			ous 1 Next

Average temperature in February - RCP45 Scenario (Frumușani - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

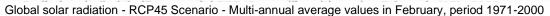
#### 4.5.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.9 W/m<sup>2</sup>.





Global solar radiation in February - RCP45 Scenario (Frumuşani - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 103.3 Search: 20/1 med\_1971\_2000 date min an change\_med 🕚 change\_max 🕴 change\_min 🕴 max 2071-93.2 68.5 128.6 2071 -10.125.3 -34.8 103.3 02 - 15Showing 1 to 1 of 1 entries (filtered from 130 total entries)

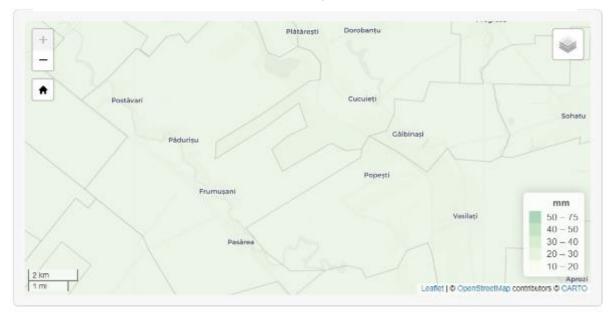
Show 5	rows *		CSV	Excel				
							Search: 2100	
date ≬	med (	min 🕴	max 🌗	an 🔶	change_med	change_max ()	change_min (	med 1971 200
2100- 02-15	107.7	59.6	135.6	2100	4.4	32.3	-43.7	7 1

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93.2 W/mp, and at the level of year 2100 it is estimated at 107.7 W/mp, which is higher than the multiannual average value of 103.3 W/mp. We can observe an increasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.5.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 21.2 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 30.7 m, and by 2100 it will reach 8.7 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

#### Rainfall in February - RCP45 Scenario (Frumușani - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

2								
Show 5	rows <del>-</del>	Сору	CSV	Excel				
							Search: 2071	
date ≬	med ()	min 🕴	max ≬	an ≬	change_med	change_max 🌢	change_min (	med_1971_2000
2071- 02-28	30.7	4.4	76.5	2071	44.6	260.3	-79.3	2
Showing 1	l to 1 of 1	entries (f	iltered fro	om 130	total entries)			ious <mark>1</mark> Next
		-			o (Frumuşani - C pentru actualizare grafi	county of Călărași c și valori	) - reference per	iod 1971-2000
Show	5 rows <del>*</del>	Сору	CSV	Excel				
							Search: 2100	
date	med 🌗	min ≬	max ≬	an ≬	change_med (	change_max (	change_min (	med_1971_2000
2100- 02-28	8.7	3	53.1	2100	-59	150.1	-85.9	21.
Showing	g 1 to 1 of	1 entries	(filtered f	rom 130	total entries)			ous 1 Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.5.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

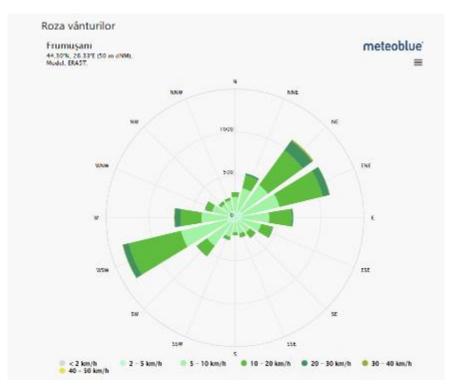


Figure No. 72- Wind rose

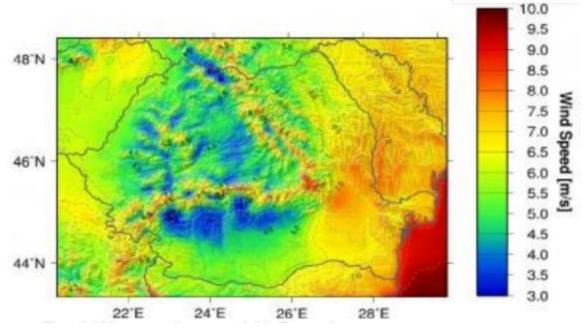


Figure No. 73- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

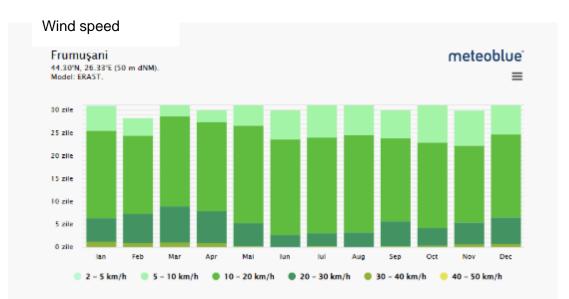


Figure No. 74- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000



In the following period 2000 - 2071 2071 - 2100, the estimated wind intensity in the locality

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

		Average v	vind spee	d in Febr	uary - R	CP45 So	cenario (Frumușa	ni - County of Căl	ărași) - reference	period 1971-2000
1	Me	dia 1971-	2000 <sup>Click</sup>	c pe hartă (r	egiunea de	interes) p	entru actualizare grafi	: și valori		
	3.5									
		Show 5	rows •	Сору	CSV	Excel				
									Search: 2071	
		date ≬	med 🌢	min 🕴	max 🌗	an 🔶	change_med 🌢	change_max 🌢	change_min 🌢	med_1971_2000 🌢
		2071- 02-28	3.2	3	4.3	2071	-0.3	0.8	-0.5	3.5
		Showing	1 to 1 of 1	l entries (	filtered fr	om 130	total entries)			ious 1 Next

Average wind speed in February - RCP45 Scenario (Frumușani - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

```
3.5
                                                                             Search: 2100
                                                                                          med_1971_2000 (
   date 💧
            med 💧
                    min 🔶
                                    an 🔶
                                           change_med 🕴 change_max 🔴
                                                                           change_min 🧄
                            max 🕚
   2100-
                                                      -0.2
                3.3
                       2.5
                                4.7 2100
                                                                      1.2
                                                                                      -1
                                                                                                         3.5
   02-28
  Showing 1 to 1 of 1 entries (filtered from 130 total entries)
```

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

### 4.6 Fundeni

### 4.6.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

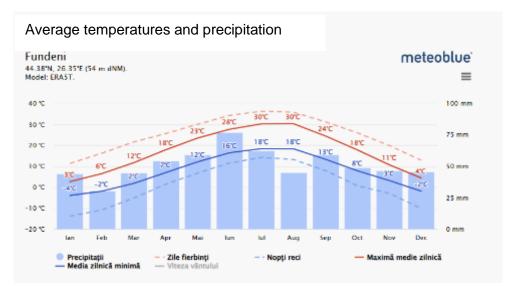
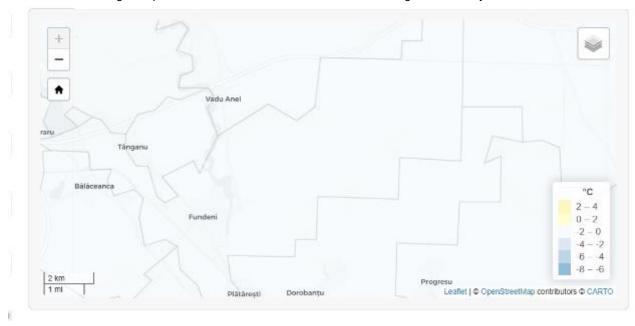


Figure No. 75 - Average value of extreme temperatures over the last 30 years at the weather station<sup>14</sup>

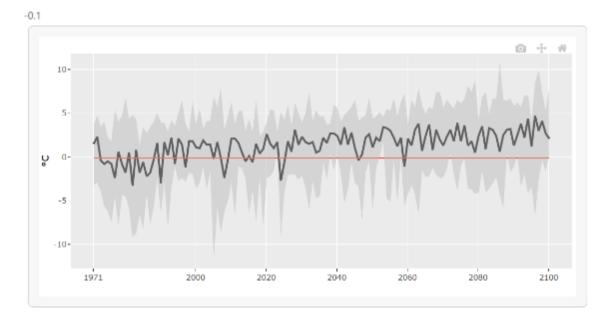
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 76 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>14</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Fundeni - County of Călărași) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (regiunea de interes) pentru actualizare grafic și valori

# In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Fundeni - County of Călărași) - reference period 1971-2000

```
Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori
```

	rows *	-copy		Littler			Search: 207	1	
date ≬	med ≬	min (	max ()	an (	change_med ()	change_max (	change_min	med_1971_20	000
2071- 02-28	2.3	-1.3	6.5	2071	2.4	6.6	-1	.2	-0.1

Average temperature in February - RCP45 Scenario (Fundeni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5 ro	ws <del>*</del>	Сору	CSV	Excel			Search: 2100	
late 🕴 m	ed ≬	min (	max (	an (	change_med ()	change_max ()		med_1971_2000
100- 2-28	2.1	0.3	7.8	2100	2.2	7.9	0.4	-0.1

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

#### 4.6.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.1 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Fundeni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

				Search: 2071	71	
≬ min ≬	max ≬ 🛛 an ≬	change med (	change max 🕴 🤞	change min 🕴 me	d 1971 2000	
8.5 68.9	128.1 2071	-9.6	25	-34.2	103	
	3.5 68.9	8.5 68.9 128.1 2071		8.5 68.9 128.1 2071 -9.6 25	8.5 68.9 128.1 2071 -9.6 25 -34.2	

Show 5	i rows •	Сору		Excel				
							Search: 2100	
date ≬	med 🌗	min (	max 🌗	an 🔶	change_med	change_max	change_min	med_1971_200
2100- 02-15	107.5	60.1	135.3	2100	4.4	32.2	-43	1

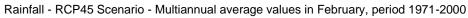
According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93.5 W/mp, and at the level of year 2100 it is estimated at 107.5 W/mp, which is higher than the multiannual average value of 103.1 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.6.3 <u>Heavy rainfall</u>

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 28.7 m, and by 2100 it will reach 8.9 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





#### Rainfall in February - RCP45 Scenario (Fundeni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

20.8

Show 5	rows -	Сору	CSV	Excel			6 h		
late 🌢	med 0	min (	max 🌢	an 🌢	change_med (	change_max 🌢	Search:		med 1971 2000 (
2071- 02-28	28.7	4.1			38	282.4	-	-80.3	20.8
howing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)				

Rainfall in February - RCP45 Scenario (Fundeni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

date 💧	med (	min 🌢	max 0	an é	change_med (	change_max 🌢	change_min	med_1971_2000
2100-	8.9	2.9	51.5	2100	-57.2	147.7	-86.1	20.

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.6.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

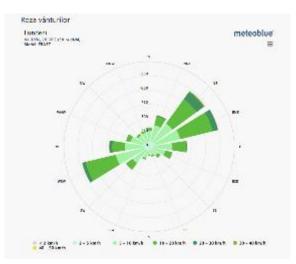


Figure No. 77- Wind rose

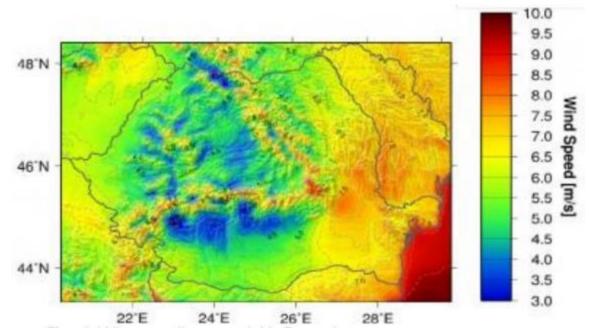


Figure No. 78- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

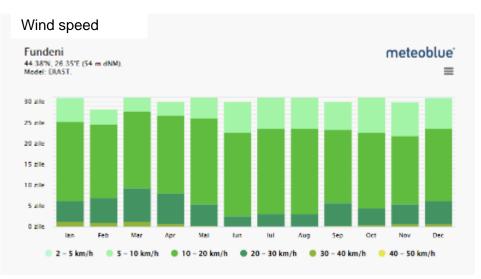
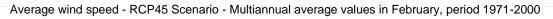


Figure No. 79- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).





In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Fundeni - County of Călărași) - reference period 1971-2000

							Search: 2071	
date ≬	$med \ \emptyset$	$\min \phi$	max ()	an ()	change_med	change_max 🌵	change_min	med_1971_2000
2071- 02-28	3.2	2.9	4.2	2071	-0.3	0.7	-0.6	3
howing	1 to 1 of 1	entries (	hitered tr	nm 130	total entries)			
ihowing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			iour 1 Next
-	wind spe	ed in Fe	bruary -	RCP4				rence period 197
verage edia 197	wind spe 1-2000 <sup>CI</sup>	ed in Fe	bruary - (regiunea d	RCP4	5 Scenario (Fun 2000 pentru actualizare gra			rence period 197
verage edia 197	wind spe	ed in Fe	bruary - (regiunea d	RCP4	5 Scenario (Fun 2000 pentru actualizare gra		Călărași) - refe	rence period 197
verage edia 197	wind spe 1-2000 <sup>CI</sup>	ed in Fe	bruary - (regiunea d	RCP4	5 Scenario (Fun 2000 pentru actualizare gra			rence period 197
verage edia 197 5 Shov	wind spe 1-2000 <sup>CI</sup>	ed in Fe kk pe hartå Copy	bruary - (regiunea d	RCP4{ de interes) Excel	5 Scenario (Fun 2000 pentru actualizare gra	tic și valori	Călărași) - refe Search: 2100	rence period 197

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 4.7 Gălbinași

## 4.7.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

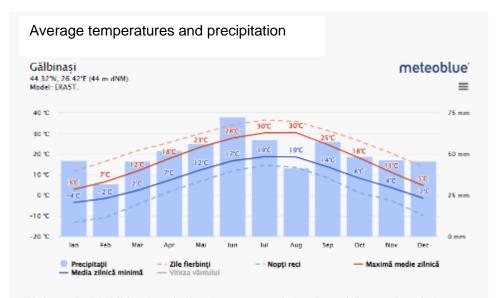


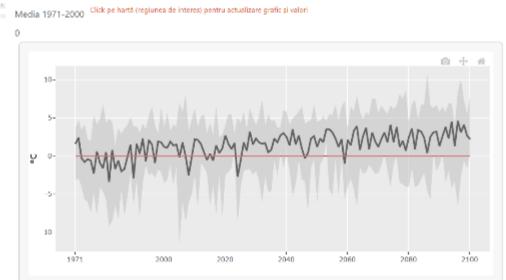
Figure No. 80 - Average value of extreme temperatures over the last 30 years at the weather station<sup>15</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0°C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 81 - Average temperature at TAU level (period 1971 -2000)



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Gălbinași - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	rows <del>*</del>	Сору	CSV	Excel				
							Search: 2071	
date ≬	med ≬	min ≬	max 🌗	an ≬	change_med	change_max	change_min	med_1971_2000
2071- 02-28	2.2	-1.2	6.6	2071	2.2	6.6	-1.2	
Showing 1	to 1 of 1	entries (f	iltered fr	om 130 f	total entries)			
								ous 1 Next

Average temperature in February - RCP45 Scenario (Gălbinași - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

snow 5	rows *	Сору	CSV	Excel			Search: 2100	
late ≬	med 🌖	min (	max (	an (	change_med (	change_max (	change_min (	med_1971_2000
2100-	2.2	0.3	7.9	2100	2.2	7.9	0.3	

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 4.7.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.4 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Gălbinași - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 103.4



							Search: 2100	
date ≬	med ()	min ()	max (	an ≬	change_med	change_max 🌢	change_min 🕴	med_1971_200
2100- 02-15	107.9	59.5	135.8	2100	4.5	32.4	-43.9	1

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93 W/mp, and at the level of year 2100 it is estimated at 107.9 W/mp, which is higher than the multiannual average value of 103.4 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.7.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 21.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 28 mm, and by 2100 it will reach 9.2 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

#### Rainfall in February - RCP45 Scenario (Gălbinași - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Media 1971-2000 Click pe hartà (regiunea de interes) pentru actualizare grafic și valori

21.1

2

							Search: 2071	
date ≬	med ()	min (	max (	an (	change_med	change_max	change_min (	med_1971_2000 ()
2071- 02-28	28	4.5	74	2071	32.7	250.6	-78.7	21.1

Rainfall in February - RCP45 Scenario (Gălbinași - County of Călărași) - reference period 1971-2000

1 Show !	5 rows +	Сору	CSV	Excel			Search:	2100		
date ()	med ()	min (	max ()	an ()	change_med ≬	change_max (	change_n	nin () r	ned_1971_2	000
2100- 02-28	9.2	3.4	52.2	2100	-56.4	147.3		-83.9		21.1
Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)				us 1 N	

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.7.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

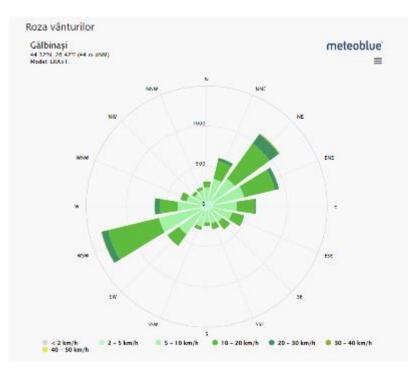


Figure No. 82- Wind rose

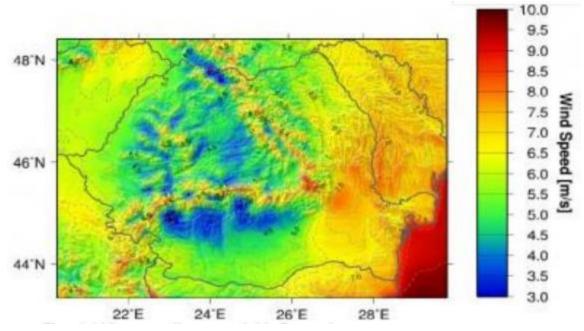


Figure No. 83- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

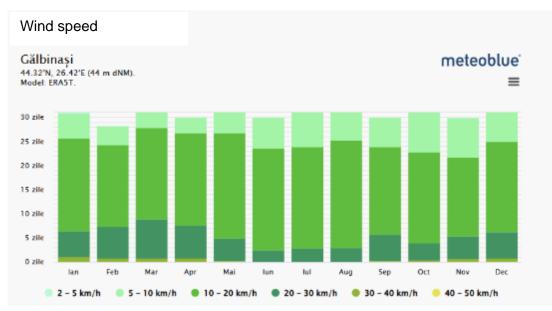
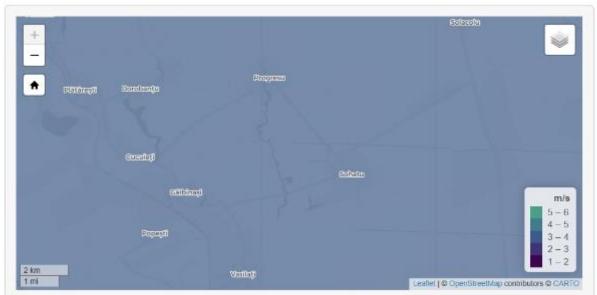


Figure No. 84- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.6 m/s - in February (as shown in the graph below).



Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.3 m/s, and 3.4 m/s in 2100, respectively.

#### Average wind speed in February - RCP45 Scenario (Gălbinași - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.6

							Search: 2071	
date 🕴	med ≬	min 🔶	max ≬	an 🔶	change_med ()	change_max 🌢	change_min 🌢	med_1971_2000
2071- 02-28	3.3	3	4.3	2071	-0.3	0.7	-0.б	3.

Average wind speed in February - RCP45 Scenario (Gălbinași - County of Călărași) - reference period 1971-2000

3.6									
	Show 5	rows <del>*</del>	Сору	CSV	Excel			Search: 2100	
	date ≬	med 🕴	min (	max (	an (	change_med	change_max (	change_min (	med_1971_2000 (
	2100- 02-28	3.4	2.5	4.8	2100	-0.2	1.2	-1.1	3.6
:	Showing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)			ious 1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 4.8 Mitreni

#### 4.8.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

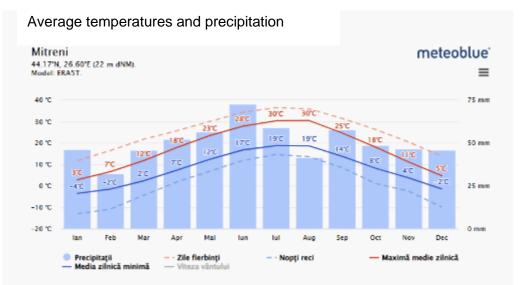


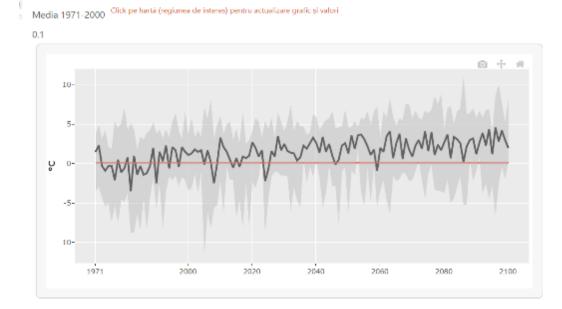
Figure No. 85 - Average value of extreme temperatures over the last 30 years at the weather station<sup>16</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0.1°C:



Average temperature - RCP45 scenario- multi-annual averages - Februarv 1971-2000

Figure No. 86 - Average temperature at TAU level (period 1971 -2000)



Average temperature in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search: 2071	
date ≬	med $\phi$	min ()	max (	an ()	change_med ()	change_max (	change_min	med_1971_2000
2071- 02-28	2.3	-0.9	6.7	2071	2.2	6.6	-1	0.

Average temperature in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 0.1 Search: 2100 date change\_med 🕴 change\_max 🧄 change\_min 🔶 med\_1971\_2000 ( med min max an 🔶 2100-0.2 2 03 8.1 2100 19 8 0.1 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

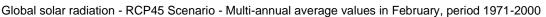
## 4.8.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.3 W/m<sup>2</sup>.





-----

103.3

Global solar radiation in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe bartă (reglunea de interes) pentru actualizare grafic și valori

Search: 2071 med 1971 2000 date change\_med | change\_max 🕴 change\_min 🕴 med min max an 2071--10.9 26.8 103.3 92.4 67.3 130.1 2071 -36 02-15 Showing 1 to 1 of 1 entries (filtered from 130 total entries) Previous 1

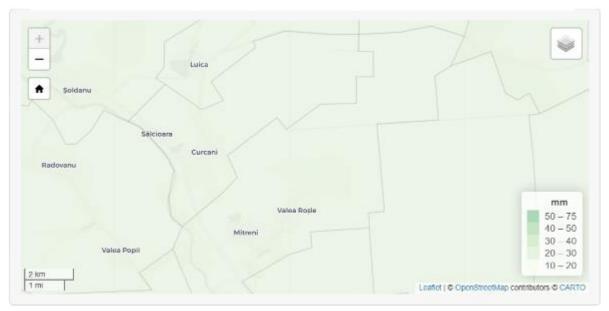
Show 5		Сору						
							Search: 2100	
date 💧	med ≬	min	max ≬	an (	change_med	change_max 🌢	change_min ()	med_1971_200
2100- 02-15	108.3	57.7	135.9	2100	5	32.6	-45.6	1

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.4 W/mp, and at the level of year 2100 it is estimated at 108.3 W/mp, which is higher than the multiannual average value of 103.3 W/mp. We can observe an increasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.8.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.0 m, and by 2100 it will reach 10.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

#### Rainfall in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartà (regiunea de interes) pentru actualizare grafic și valori

SHOW :	5 rows *	Сору	CSV	Excel			Search: 2071	
date ≬	med ()	min (	max $\phi$	an ()	change_med ()	change_max 🌖	change_min	med_1971_2000
2071- 02-28	25.5	9.5	66	2071	18.1	205.6	-56	21.

Rainfall in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

21.6

Show 5	5 rows <del>*</del>	Сору	CSV	Excel					
							Search: 21	00	
date 🌗	med $\phi$	$\min  \phi$	max (	an ≬	change_med	change_max (	change_min	med_197	71_2000
2100- 02-28	13.4	3.7	44.8	2100	-38	107.4	-82	.9	21.6
Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			revious 1	Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.8.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

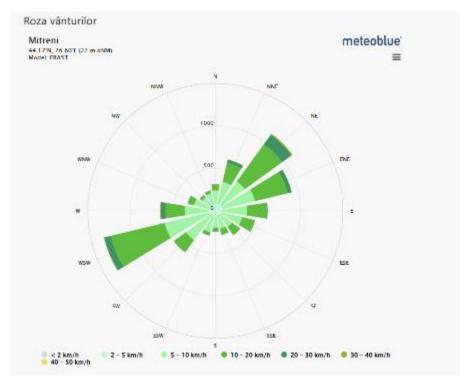


Figure No. 87- Wind rose

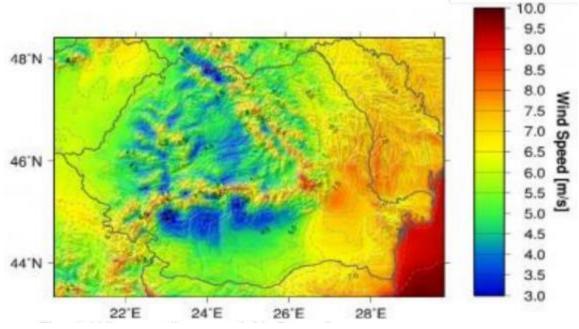


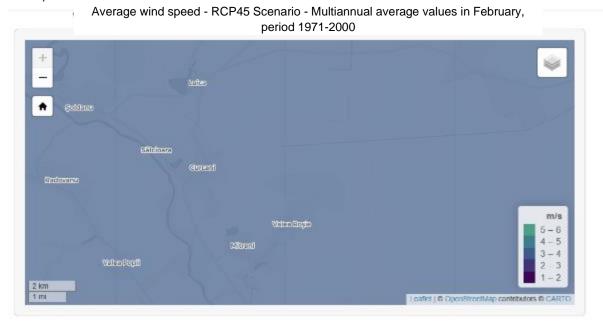
Figure No. 88- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.



Figure No. 89- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.7 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.4 m/s, and 3.6 m/s in 2100, respectively.

	i rows *						Search:	2071	
date ≬	med (	min (	max (	an ()	change_med	change_max (	change_mi	n 🕴 med_197	1_2000 (
071-	3.4	3.2	4.5	2071	-0.3	0.8		-0.5	3.7

Average wind speed in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartà (regiunea de interes) pentru actualizare grafic și valori

Average wind speed in February - RCP45 Scenario (Mitreni - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	i rows +	Сору	CSV	Excel			Search: 2100	
date 🌗	med ()	min (	max (	an 🕴	change_med ()	change_max 🌢	change_min (	med_1971_2000 (
2100- 02-28	3.6	2.5	5.1	2100	-0.1	1.4	-1.2	3.7
Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			ious 1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 4.9 Oltenița

## 4.9.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

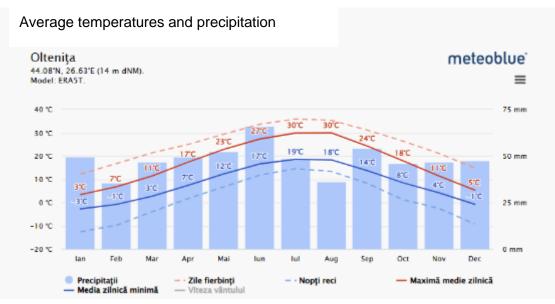


Figure No. 90 - Average value of extreme temperatures over the last 30 years at the weather station<sup>17</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0.2 °C:



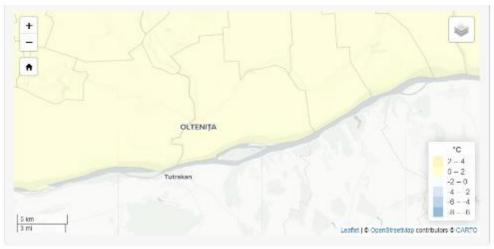
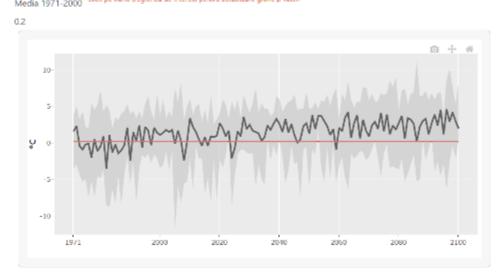


Figure No. 91 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>17</sup> Source: *www.meteoblue.com* 



Average temperature in February - RCP45 Scenario (Oltenița - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regunea de interes) pentru actualizare grafic și valori

# In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Oltenița - County of Călărași) - reference period 1971-2000

Show 5 r	ows <del>*</del>	Сору	CSV	Excel							
								1	Search: 2071		
date ≬	med 🌗	min 🕴	max 🌗	an (	change_m	ied 🔶	change_ma	x ∳ cl	hange_min 🌢	med_197	71_2
2071- 02-28	2.4	-0.8	6.7	2071		2.2		6.5	-1		
Showing 1 t	o 1 of 1	entries (fi	iltered fro	om 130 f	total entries)	)					
Avera	age temp	erature in	February	- RCP45	5 Scenario (O	Itenița - (	County of Că	ılăraşi) -	Previ		Ne 0
Avera ledia 1971-2 2					i Scenario (O entru actualizar	,	-	ılăraşi) -			
edia 1971-2 2	2000 Click		egiunea de	interes) p		,	-		reference perioc		
edia 1971-2 2	2000 Click	c pe hartă (r	egiunea de	interes) p		,	-				
edia 1971-2 2	2000 Click	c pe hartă (n Copy	egiunea de CSV	interes) p Excel	entru actualizar	e grafic și	valori	S	reference perioc	1 1971-2000	0

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

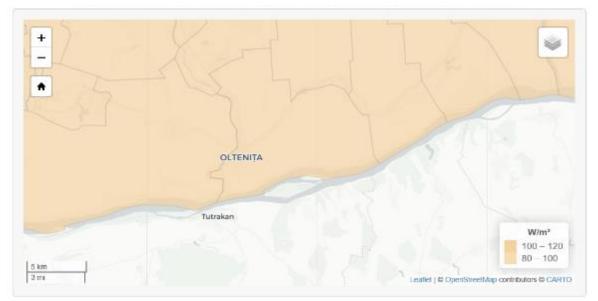
Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

#### 4.9.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.4 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Oltenița - County of Călărași) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.4

Show 5		Сору		Excel				
							Search: 2071	
date ≬	med 🌗	$\min \phi$	max 🌗	an ≬	change_med	change_max 🌢	change_min 🌗	med_1971_2000
2071- 02-15	92.1	67.2	130.3	2071	-11.3	26.9	-36.2	103.4
howing 1	to 1 of 1	entries (f	iltered fro	om 130 t	total entries)			
								ous 1 Next

Show 5	rows •	Сору	CSV	Excel				
							Search: 2100	
date ≬	med ≬	min (	max 🕴	an 🔶	change_med 🌢	change_max 🌢	change_min 🕴	med 1971 2000
2100- 02-15	108.5	57.7	136	2100	5.1	32.6	-45.7	10

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.1 W/mp, and at the level of year 2100 it is estimated at 108.5 W/mp, which is higher than the multiannual average value of 103.4 W/mp. We can observe an increasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.9.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 21.7 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 26.1 mm, and by 2100 it will reach 14.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Rainfall in February - RCP45 Scenario (Oltenița - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

21.7

							Search: 2071	
date ≬	med 🌗	min 🕴	max ≬	an (	change_med 🌒	change_max 🌢	change_min 🕴	med 1971 2000
2071- 02-28	26.1	10.7	63.6	2071	20.3	193.2	-50.7	21.

Rainfall in February - RCP45 Scenario (Oltenița - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

r								
Show 5	rows •	Сору	CSV	Excel				
							Search: 2100	
date 🌗	med 🕴	min 🕴	max $\phi$	an 🕴	change_med ()	change_max (	change_min 🌢	med_1971_2000 (
2100- 02-28	14.1	3.5	45.7	2100	-35	110.7	-83.9	21.7
Showing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)			ious <mark>1</mark> Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.9.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

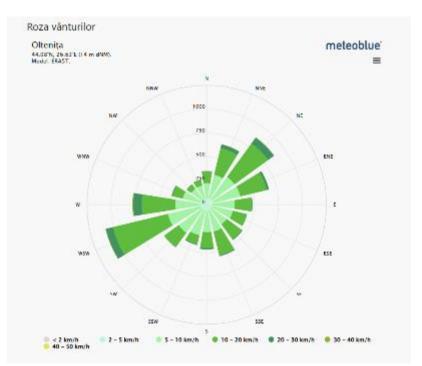


Figure No. 92- Wind rose

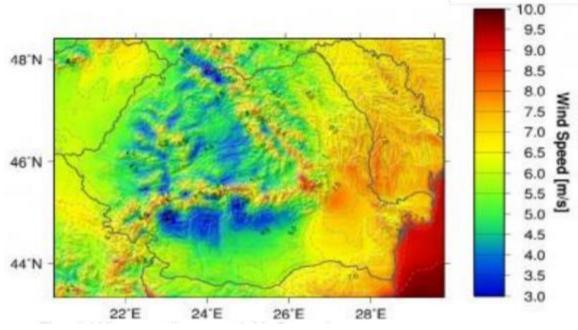


Figure No. 93- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

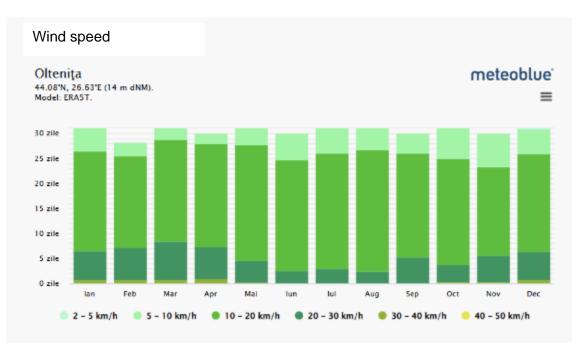
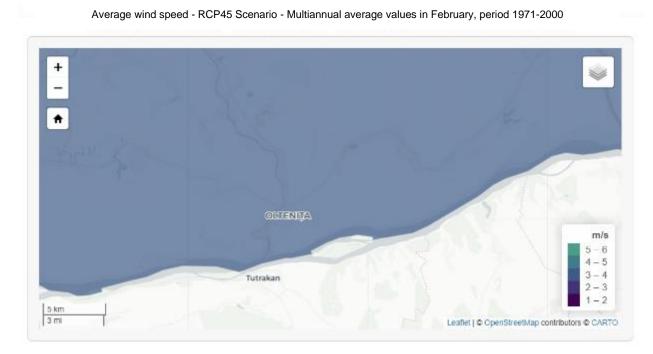


Figure No. 94- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.8 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.4 m/s, and 3.7 m/s in 2100, respectively.

#### Average wind speed in February - RCP45 Scenario (Oltenița - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	rows •	Сору	CSV	Excel					
							Search:	2071	
date ()	med ()	min (	max ≬	an $\phi$	change_med	change_max 🌢	change_n	nin 🕴 m	ed_1971_2000
2071- 02-28	3.4	3.2	4.5	2071	-0.4	0.7		-0.6	3.8
Showing 1	1 to 1 of 1	entries (	filtered fr	om 130	total entries)				: 1 Next

Average wind speed in February - RCP45 Scenario (Oltenița - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.8

Show 5	i rows <del>-</del>	Сору	CSV	Excel				
							Search: 2100	
date 🌗	med ≬	$\min  \phi$	max $\phi$	an ≬	change_med 🌖	change_max 🌖	change_min ≬	med_1971_2000
2100- 02-28	3.7	2.5	5.1	2100	-0.1	1.3	-1.3	3
Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			vious 1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 4.10 Plătărești

#### 4.10.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

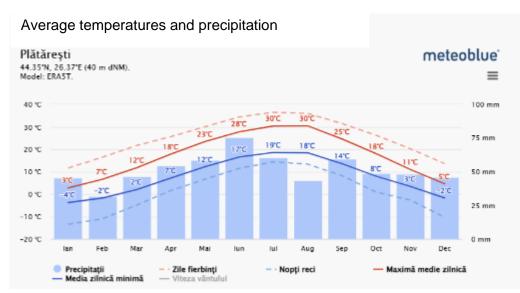
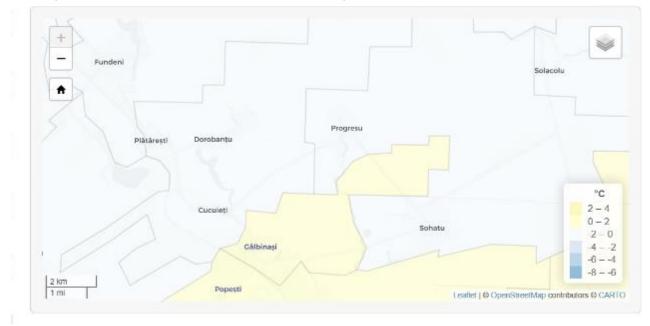


Figure No. 95 - Average value of extreme temperatures over the last 30 years at the weather station<sup>18</sup>

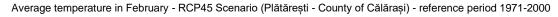
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



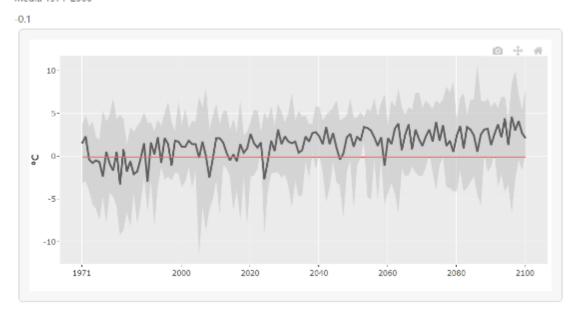
Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 96 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>18</sup> Source: www.meteoblue.com



Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

				Excel				
							Search: 2071	
date 💧	med ()	min (	max (	an $\phi$	change_med	change_max	change_min	med_1971_200
2071- 02-28	2.3	-1.2	6.5	2071	2.4	6.6	-1.1	

Average temperature in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

Show 5	rows *	Сору	CSV	Excel				
							Search: 2100	
date 💧	med 🕴	min 🕴	max (	an ≬	change_med 🌢	change_max ≬	change_min (	med_1971_2000
2100- 02-28	2.1	0.3	7.8	2100	2.2	7.9	0.4	

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 4.10.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.3 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Grafic Data

Global solar radiation in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.3

Show 5	rows <del>*</del>	Сору	CSV	Excel			Coursely 2074	
							Search: 2071	
date 🌖	med ≬	min	max 🌵	an 🕴	change_med ()	change_max ()	change_min ()	med_1971_2000
2071- 02-15	93.5	68.8	128.1	2071	-9,8	24.8	-34.5	103.3
	to 1 of 1	entries (f	iltered fr	om 130 f	total entries)			
					-			us 1 Next

Global solar radiation in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.3

Show 5	rows <del>*</del>	Сору	CSV	Excel			Search: 2100	
date ≬	med ≬	min 🕴	max ≬	an ≬	change_med (	change_max	change_min	med_1971_2000
2100- 02 <b>-1</b> 5	107.6	60.1	135.5	2100	4.3	32.2	-43.2	103.3
howing 1	to 1 of 1	entries (f	iltered fro	om 130 f	total entries)			ous 1 Next

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93.5 W/mp, and at the level of year 2100 it is estimated at 107.6 W/mp, which is higher than the multiannual average value of 103.3 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 4.10.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.0 m, and by 2100 it will reach 10.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

		Сору						
							Search: 2071	
date ≬	med ()	min (	max ()	an (	change_med	change_max 🌢	change_min ≬	med_1971_20
2071- 02-28	29.3	4.2	77.2	2071	38.3	264.4	-80.2	

Rainfall in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

Rainfall in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

21.2

Show 5	rows <del>*</del>	Сору	CSV	Excel				
							Search: 2100	
date 🌗	med (	min 🕴	max 🌗	an ≬	change_med ()	change_max 🌖	change_min 🌢	med_1971_2000
2100- 02-28	8.7	3.1	52.8	2100	-58.9	149.2	-85.4	21.2
Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			ious 1 Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

## 4.10.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

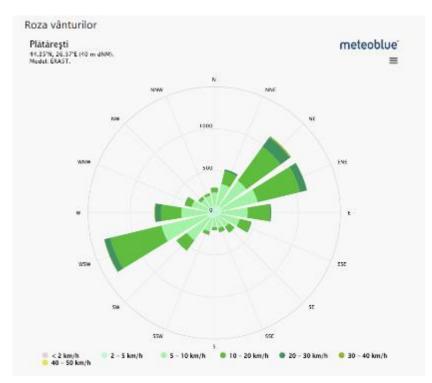


Figure No. 97- Wind rose

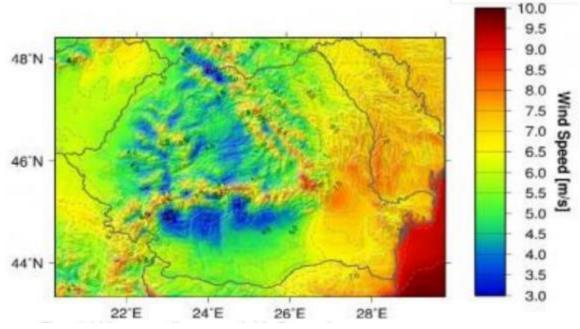


Figure No. 9813 - Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

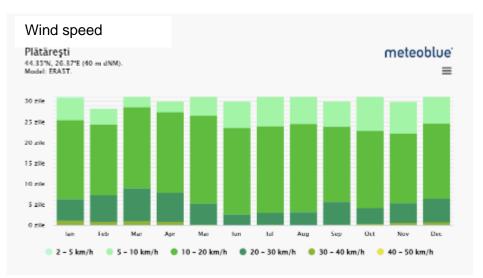
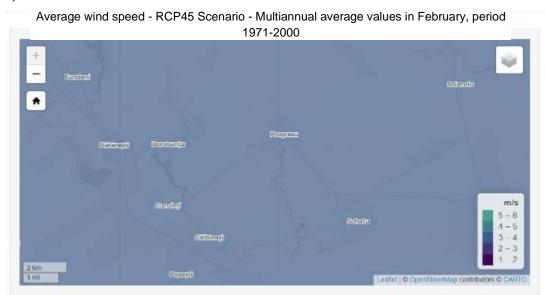


Figure No. 99- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.6 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.3 m/s, and 3.4 m/s in 2100, respectively.

# Average wind speed in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

SHOWS	orows -	Сору	CSV	Excel			Search: 2071	
date (	med ()	min (	max ()	an (	change_med	change_max	change_min	med_1971_2000
2071- 02-28	3.3	3	4.3	2071	-0.3	0.7	-0.6	:

Average wind speed in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search:	2100		
date 🌖	med 0	min (	max (	an ≬	change_med	change_max	change_n	nin ()	med_1971_	2000 🕚
2100- 02-28	3.4	2.5	4.8	2100	-0.2	1.2		-1.1		3.6

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

# 4.11 Radovanu

2.0

#### 4.11.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

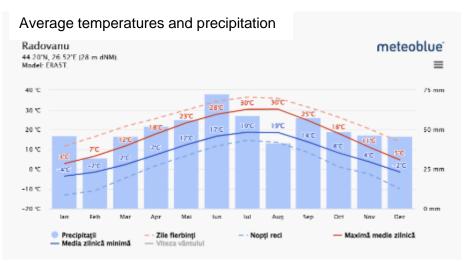


Figure No. 100 - Average value of extreme temperatures over the last 30 years at the weather station<sup>19</sup>

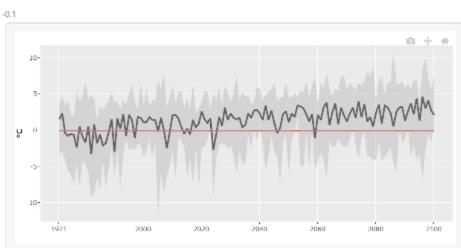
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0.2 °C:



Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

Figure No. 101 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>19</sup> Source: *www.meteoblue.com* 



Average temperature in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hantă (regiunea de interes) pentru actualizare grafic și valori

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5		Сору		Excel					
							Search: 207	71	
date ≬	med $\phi$	$\min \phi$	max (	an (	$\mathbf{change\_med} \ \emptyset$	change_max	change_min	med_197	1_2000
2071- 02-28	2.3	-1.2	6.5	2071	2.4	6.6	-1	.1	-0.
Showing 1	to 1 of 1	entries (f	iltered fr	om 130 f	total entries)			evious 1	

Average temperature in February - RCP45 Scenario (Plătărești - County of Călărași) - reference period 1971-2000

Show 5	rows -	Сору	CSV	Excel				
							Search: 2100	
late ≬	med $\phi$	$\min \phi$	max $\phi$	an $\phi$	change_med ()	change_max 🌢	change_min ≬	med_1971_2000
2100- 02-28	2.1	0.3	7.8	2100	2.2	7.9	0.4	-0.1

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

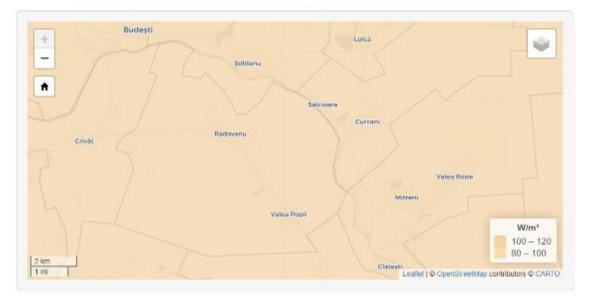
Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

# 4.11.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.4 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000 -

Global solar radiation in February - RCP45 Scenario (Radovanu - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.4

Show 5	i rows +	Сору	CSV	Excel				
							Search: 2071	
date ≬	med $\phi$	min 🔶	max 🌗	an (	change_med 🌢	change_max 🌢	change_min	med_1971_2000 ≬
2071- 02-15	92.7	66.9	130	2071	-10.7	26.6	-36.5	103.4
Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			ious <mark>1</mark> Next

Global solar radiation in February - RCP45 Scenario (Radovanu - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.4

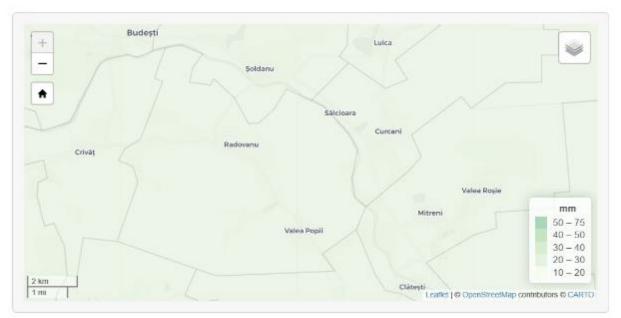
							Search: 2100	
date 🌖	med 🌢	min (	max 🌗	an ≬	change_med	change_max	change_min	med_1971_2000
2100- 02-15	108.3	58.8	135.9	2100	4.9	32.5	-44.6	103.4

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.7 W/mp, and at the level of year 2100 it is estimated at 108.3 W/mp, which is higher than the multiannual average value of 103.4 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.11.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.0 mm, and by 2100 it will reach 10.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

							Search: 207	1
date ≬	med (	$\min \phi$	max ≬	an ≬	change_med	change_max	change_min	med_1971
2071- 02-28	25.7	9.1	65.3	2071	15.8	194.1	-59	9
edia 1971		-			) (Radovanu - Co	-		evious 1 N
edia 1971 .2		s pe hartă (i	regiunea de			-	și) - reference p	
edia 1971 .2	1-2000 <sup>Clid</sup> S rows *	s pe hartă (i	regiunea de	interes) p		și valori		period 1971-2

Rainfall in February - RCP45 Scenario (Radovanu - County of Călărași) - reference period 1971-2000

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

## 4.11.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

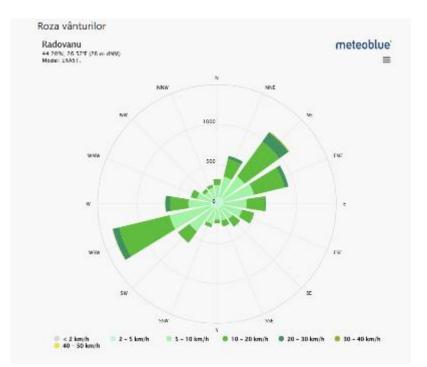


Figure No. 102- Wind rose

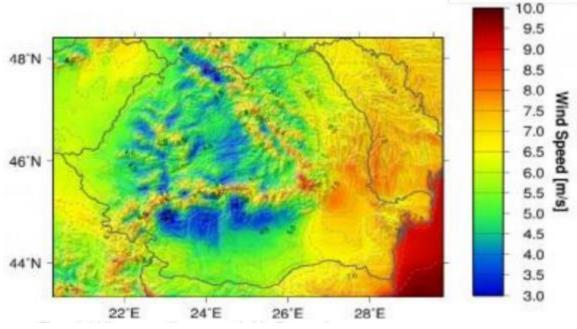


Figure No. 103- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

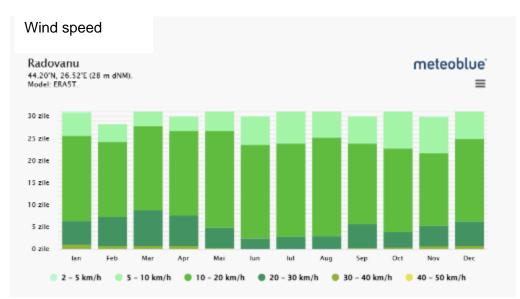
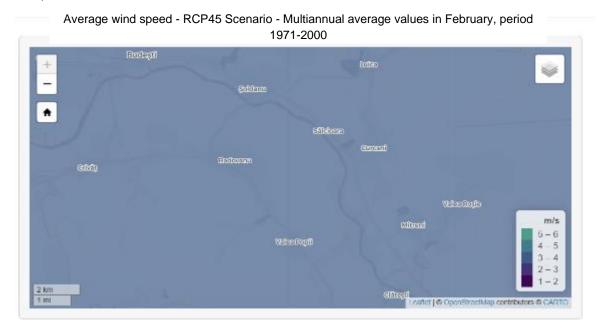


Figure No. 104- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.7 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.3 m/s, and 3.5 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Radovanu - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search: 207	1
date ≬	med ()	min (	max (	an (	change_med	change_max (	change_min (	med_1971_2000
071- 2-28	3.3	3.2	4.4	2071	-0.4	0.7	-0.5	5 3.

Average wind speed in February - RCP45 Scenario (Radovanu - County of Călărași) - reference period 1971-2000

							Search: 2100	
date ≬	med ≬	$\min  \phi$	max ≬	an ()	change_med	change_max ≬	change_min 🌢	med_1971_2000
2100- 02-28	3.5	2.5	5	2100	-0.2	1.3	-1.2	:

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

# 4.12 Soldanu

#### 4.12.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

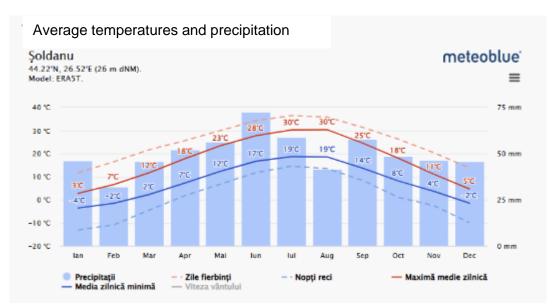


Figure No. 105 - Average value of extreme temperatures over the last 30 years at the weather station<sup>20</sup>

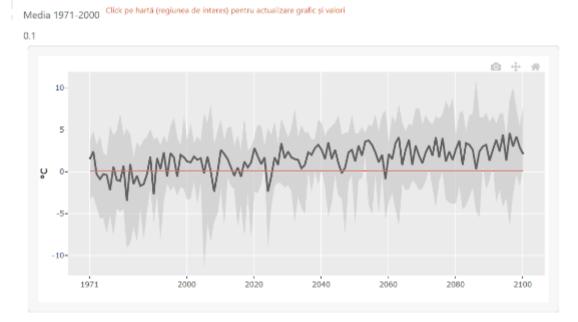
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0.1°C:

Average temperature – RCP45 scenario - multi-annual averages – February 197-2000



Figure No. 106 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>20</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Şoldanu - County of Călărași) - reference period 1971-2000

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Şoldanu - County of Călărași) - reference period 1971-2000

```
Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori
```

0.1 Search: 2071 change\_min 🌗 med\_1971\_2000 ( date change\_med 🕴 change\_max ≬ med ( min max an 🗄 2071-2.3 2071 2.2 6.6 -1.2 0.1 -1.1 6.7 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries) Average temperature in February - RCP45 Scenario (Soldanu - County of Călărași) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 0.1 Search: 2100

change\_med 🕴 change\_max 🔴 change\_min ≬ med\_1971\_2000 date an 💧 med 🕚 min 🕚 max 🔶 2 2100-2100 7.8 0.3 0.1 2.1 0.47.9 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 4.12.2 Heat stress

103.3

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.3 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Şoldanu - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	rows •	Сору	CSV	Excel				
							Search: 2071	
date ≬	med ≬	min 🕴	max ≬	an 🔶	change_med	change_max 🌢	change_min	med 1971 2000
2071- 02-15	93	67.7	129	2071	-10.3	25.7	-35.6	5 103.3
	to 1 of 1	entries (f	iltered fro	om 130 f	total entries)			
								vious 1 Next



Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.3 Search: 2100 med\_1971\_2000 ( date an 🔶 change\_med change\_max | change\_min 🔶 med 🕚 min max 2100 108 59.4135.8 2100 47 32.5 43.9 103.3 02-15 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 93.0 W/mp, and at the level of year 2100 it is estimated at 108.0 W/mp, which is higher than the multiannual average value of 103.3 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 4.12.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 21.5 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 25.7 mm, and by 2100 it will reach 12 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

#### Rainfall in February - RCP45 Scenario (Șoldanu - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

					•		Search: 2071	
date ≬	med ()	$\min \phi$	max (	an (	change_med	change_max	change_min	med_1971_2000
2071- 02-28	25.7	7	70.2	2071	19.6	226.8	-67.4	2

Rainfall in February - RCP45 Scenario (Soldanu - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

Show 5	i rows +	Сору	CSV	Excel				
							Search: 2100	
date ≬	med 🌗	$\min  \phi$	max 🌗	an (	change_med 🌗	change_max 🌖	change_min ≬	med_1971_2000
2100- 02-28	12	3.5	48.6	2100	-44.1	126.3	-83.7	21.
showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			ious 1 Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 4.12.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

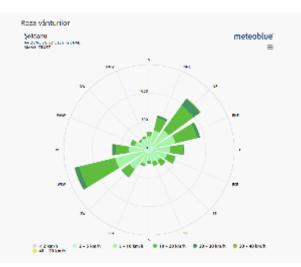


Figure No. 107- Wind rose

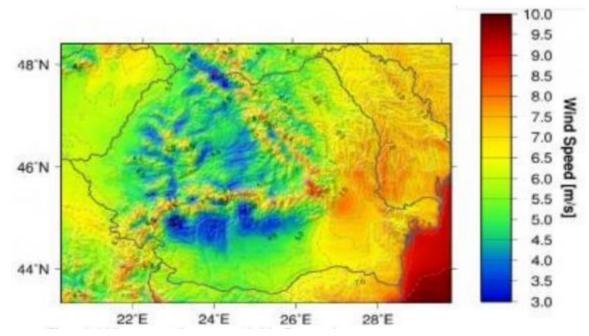


Figure No. 108- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

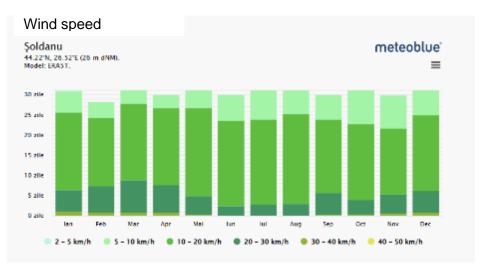
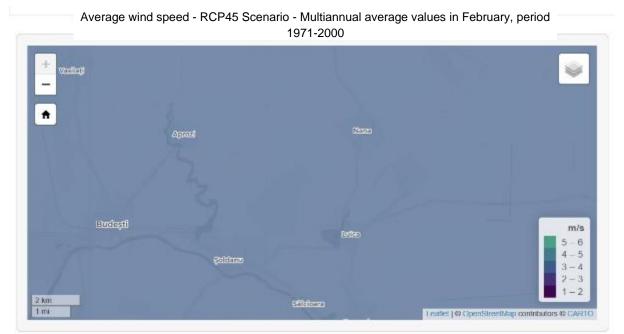


Figure No. 109- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.7 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

#### Average wind speed in February - RCP45 Scenario (Soldanu - County of Călărași) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.7										
1	Show 5	rows *	Сору	CSV	Excel					
								Search: 20	071	
	date ≬	med ≬	min (	max 🌢	an ≬	change_med 🌢	change_max 🌢	change_min	( med_197	1_2000 ()
	2071- 02-28	3.3	3.2	4.4	2071	-0.4	0.7	-(	0.5	3.7
3	Showing 1	to 1 of 1	entries (	filtered fr	om 130	total entries)			revious 1	

Average wind speed in February - RCP45 Scenario (Şoldanu - County of Călărași) - reference period 1971-2000

							Search: 2100	
date ≬	med )	min (	max (	an $\phi$	change_med	change_max	change_min (	med_1971_2000
2100- 02-28	3.5	2.5	4.9	2100	-0.2	1.2	-1.2	3.7

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

# 5 Giurgiu County

## 5.1 Adunații Copăceni

#### 5.1.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

#### Average temperature and precipitation

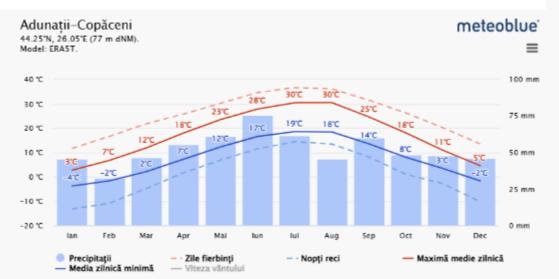
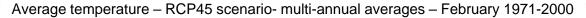


Figure No. 110 - Average value of extreme temperatures over the last 30 years at the weather station<sup>21</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



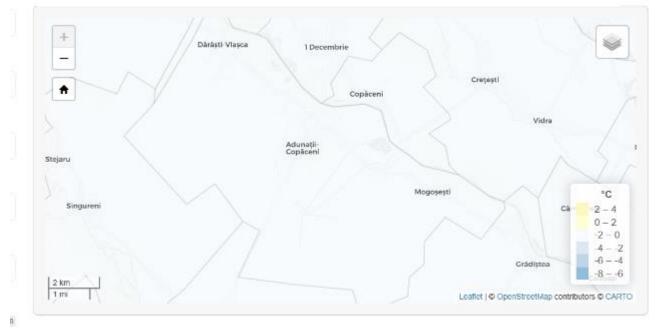
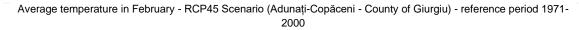
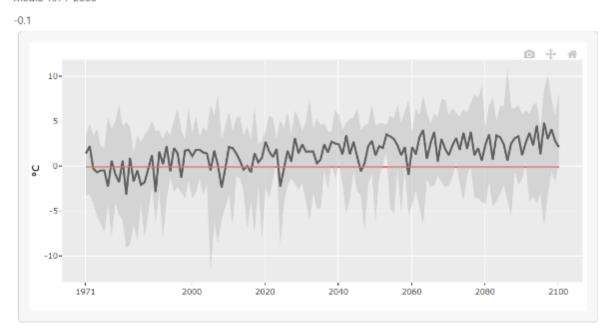


Figure No. 111 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>21</sup> Source: www.meteoblue.com

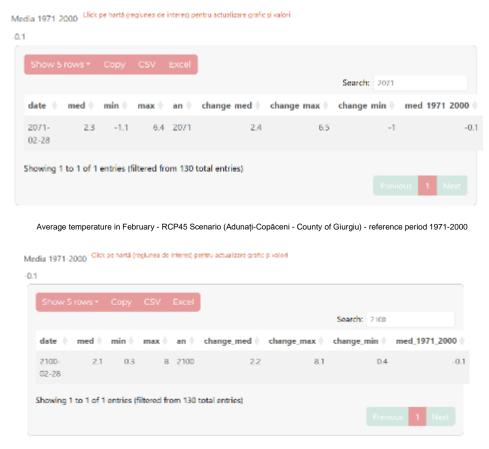


Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Adunați-Copăceni - County of Giurgiu) - reference period 1971-2000



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

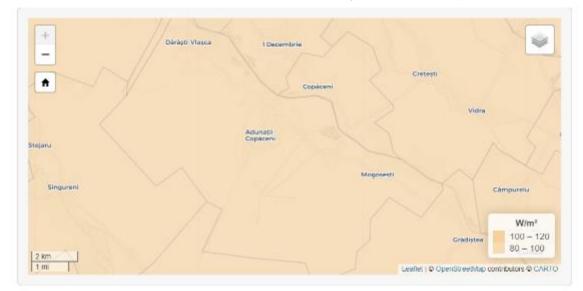
Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

# 5.1.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 104.1 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Adunați-Copăceni - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Search: 2071 change\_med 🕴 change\_max 🔶 change\_min 🔶 med\_1971\_2000 date 🔶 med 🕚 min 🕚 max 🕘 an 🔶 2071-24 -36.5 104.1 92.8 67.6 128.1 2071 -11.3 02-15 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

104.1

Global solar radiation in February - RCP45 Scenario (Adunați-Copăceni - County of Giurgiu) - reference period 1971-2000



According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.8 W/mp, and at the level of year 2100 it is estimated at 108.3 W/mp, which is higher than the multiannual average value of 104.1 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is medium.

# 5.1.3 <u>Heavy rainfall</u>

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 42 mm, and by 2100 it will reach 10.0 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





#### Rainfall in February - RCP45 Scenario (Adunați-Copăceni - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 24.1 Search: 2071 change\_max 🌢 change\_min 🔶 med\_1971\_2000 ( date 💧 change\_med 🧄 med 🍈 min 🔶 max 🔶 an 🔶 2071-42 80.4 2071 74.2 233.6 -82.2 24.1 4.3 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Rainfall in February - RCP45 Scenario (Adunați-Copăceni - County of Giurgiu) - reference period 1971-2000

Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show:	5 rows *	Сору	CSV	Excel			Search: 21	100
date ≬	med (	min (	max (	an ≬	change_med	change_max (	change_min	med_1971_2
2100- 02-28	10	3.5	60.2	2100	-58.5	149.8	-85	5.5

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 5.1.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

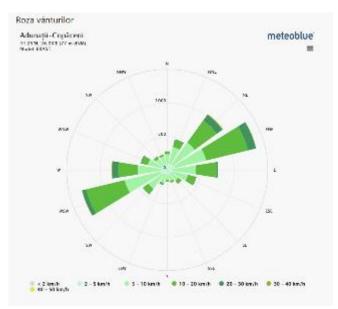


Figure No. 112- Wind rose

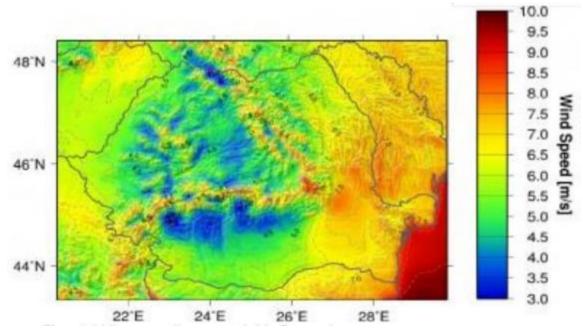


Figure No. 113- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

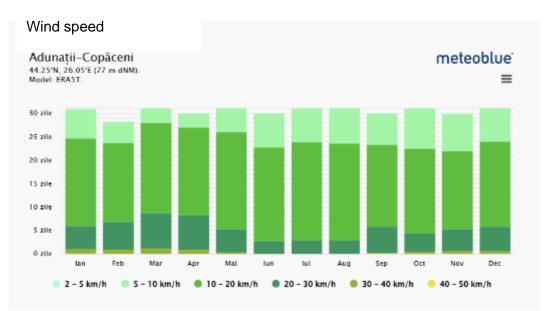


Figure No. 114- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Adunați-Copăceni - County of Giurgiu) - reference period 1971-2000

All the sector of the sector of the first sector of the se

311541 5	10/13	Сору	0.01	CAUGH			Search: 2071	
date ≬	med 0	min 0	max 0	an ()	change_med	change_max ()	change_min (	med_1971_2000
2071- 02-28	3.2	3	4.3	2071	-0.3	0.8	-0.5	3

Average wind speed in February - RCP45 Scenario (Adunați-Copăceni - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe bartă (regiunea de interes) pentru actualizare grafic și valori

					•		Search:	2100	
date ≬	med 🔶	min ()	max (	an (	change_med ()	change_max (	change_n	nin 🕴 med_	1971_2000 (
2100- 02-28	3.3	2.6	4.8	2100	-0.2	1.3		-0.9	3.5

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 5.2 Colibași

#### 5.2.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

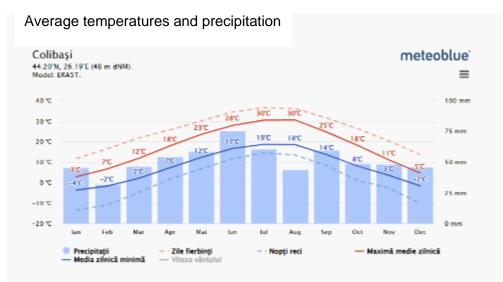
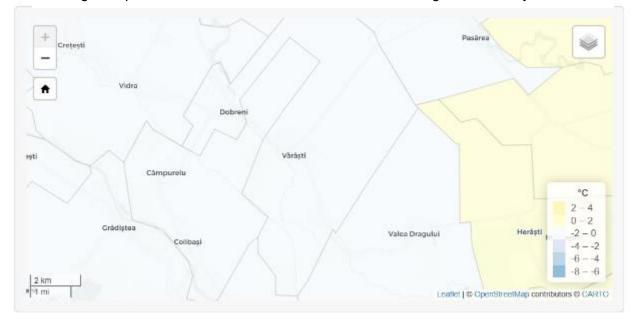


Figure No. 115 - Average value of extreme temperatures over the last 30 years at the weather station<sup>22</sup>

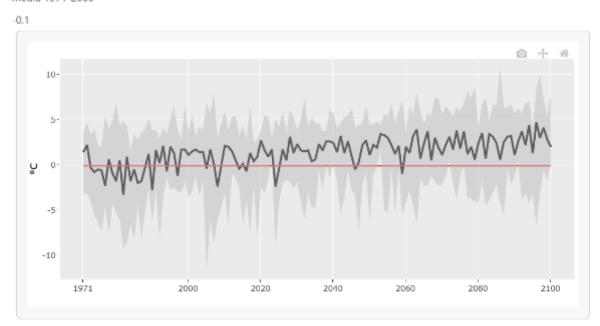
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature – RCP45 scenario- multi-annual averages – February 1971-2000

Figure No. 116 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>22</sup> Source: *www.meteoblue.com* 



#### Average temperature in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

~		

		Сору						
							Search: 2071	
date ≬	med 🌗	min 🕴	max (	an ≬	change_med	change_max 🌢	change_min 🕴	med_1971_2000 ≬
2071- 02-28	2.2	-1.2	6.5	2071	2.3	6.6	-1.1	-0.1
ihowing 1	to 1 of 1	entries (f	iltered fro	om 130 f	total entries)			ious <mark>1</mark> Next

Average temperature in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

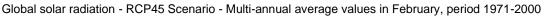
# 5.2.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.7 W/m<sup>2</sup>.





Global solar radiation in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 <sup>Click</sup> pe bartă (regiunea de interes) pentru actualizare grafic și valori

103.7 Show 5 rows + Copy CSV Excel

							Search: 2071	
date ≬	med $\phi$	$\min  \phi$	max ()	an (	change_med 🌢	change_max 🌢	change_min	med_1971_2000
2071- 02-15	91.9	67.4	129.7	2071	-11.8	26	-36.3	103.7
showing 1	to 1 of 1	entries (f	iltered fro	m 130	total entries)			
								ous 1 Next



Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

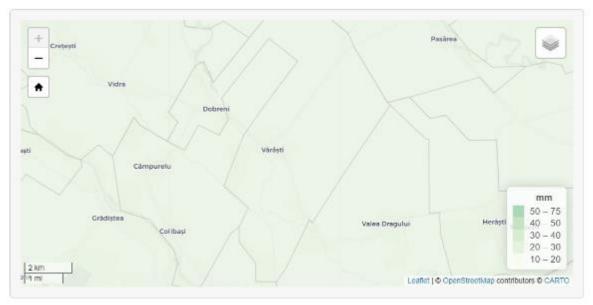
	rows *						Search: 2100	
late ≬	med	min (	max ()	an (	change_med	change_max 0	change_min (	med_1971_2000
100- 2-15	108.6	58.7	136.2	2100	4.9	32.5	-45	103.7

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 91.9 W/mp, and at the level of year 2100 it is estimated at 108.6 W/mp, which is higher than the multiannual average value of 103.7 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 5.2.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.2 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 37.5 mm, and by 2100 it will reach 9.5 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

#### Rainfall in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

23.2

							Search: 2071	
date ≬	med ()	min ()	max (	an ≬	change_med	change_max 🌢	change_min 🌖	med_1971_2000
2071- 02-28	37.5	4.3	77.7	2071	61.9	235.5	-81.4	23.2

Rainfall in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

23.2

Show 5	rows •	Сору	CSV	Excel				
							Search: 2100	
date ≬	med $\phi$	$\min \phi$	max 🌗	an (	change_med 🌢	change_max 🌖	change_min ≬	med_1971_2000
2100- 02-28	9.5	3.5	57.4	2100	-59	147.8	-84.9	23
showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			ious <mark>1</mark> Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

# 5.2.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

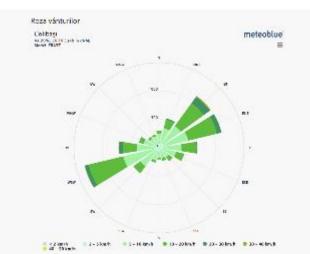


Figure No. 117- Wind rose

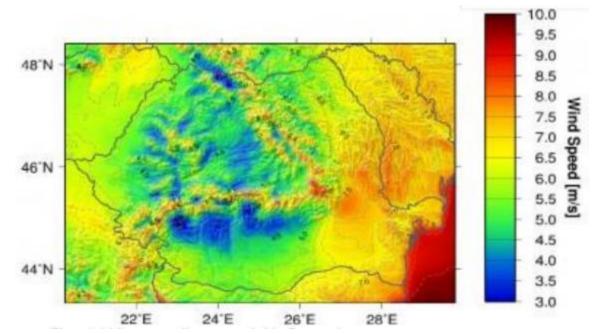


Figure No. 118- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

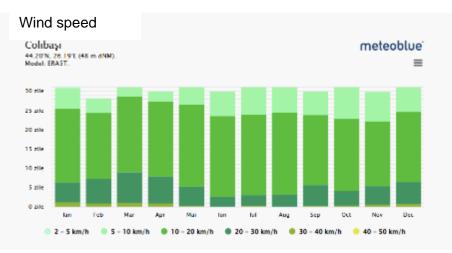


Figure No. 119- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



Average wind speed - RCP45 Scenario - Multiannual average values in February, period

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search: 20/1	
date ≬	med ()	min 🕴	max ≬	an (	change_med ()	change_max (	change_min (	med_1971_2000
2071- 02-28	3.2	3	4.3	2071	-0.3	0.8	-0.5	3

Average wind speed in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click pe bartă (reglunea de interes) pentru actualizare grafic și valori

							Search: 21	00	
late ≬	med (	min (	max ≬	an ≬	change med 🌖	change max (	change min	med 1	971 2000
100- 2-28	3.3	2.5	4.8	2100	-0.2	1.3		-1	3.

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

## 5.3 Comana

#### 5.3.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

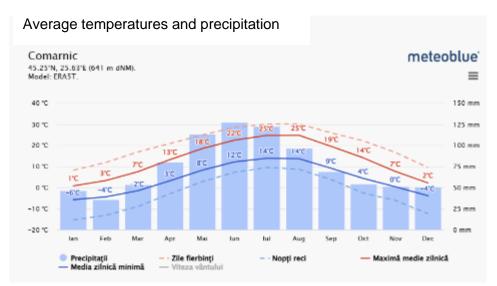


Figure No. 120 - Average value of extreme temperatures over the last 30 years at the weather station<sup>23</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in Februarv is -0.1°C:

Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

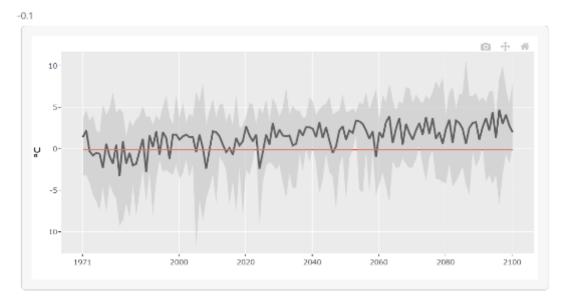


Figure No. 121 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>23</sup> Source: www.meteoblue.com



Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000	
-0.1	

							Search: 20	71
date ≬	med $\phi$	min (	max ()	an 🕴	change med (	change max 🌢	change min	med 1971 200
2071- 02-28	2.2	-1.2	6.5	2071	2.3	6.6	-1	1.1

Average temperature in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare gudic și valori 0.1 Search: 2100 change\_min 🕴 med\_1971\_2000 ( date an change\_med 🗄 change\_max 2100-0.3 7.8 2100 2.1 7.9 0.4 -0.1 2 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the risk of the project being affected by the positive temperature variation in the next period is medium.

# 5.3.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.7 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

103.7 Search: 2071 med 1971 2000 date med min an change med change max ( change min 🧄 max 2071 91.9 129.7 2071 11.8 26 36.3 103.7 67.4 02-15 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Global solar radiation in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000



According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 91.9 W/mp, and at the level of year 2100 it is estimated at 108.6 W/mp, which is higher than the multiannual average value of 103.7 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 5.3.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.2 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 37.5 mm, and by 2100 it will reach 9.5 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





#### Rainfall in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

							Search: 2071	
date ≬	med ()	min (	max (	an ()	change_med	change_max	change_min (	med_1971_2000
2071- 02-28	37.5	4.3	77.7	2071	61.9	235.5	-81.4	2

Rainfall in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

23.2									
1	Show 5	rows <del>*</del>	Сору	CSV	Excel				
								Search: 2100	
	date ≬	med ≬	min ()	max (	an (	change_med 🌖	change_max	change_min 🌢	med_1971_2000
	2100- 02-28	9.5	3.5	57.4	2100	-59	147.8	-84.9	23.2
s	ihowing 1	to 1 of 1	entries (	filtered fr	om 130	total entries)			ious 1 Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 5.3.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

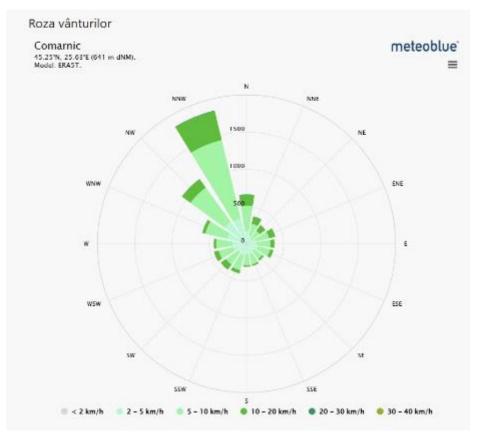


Figure No. 122- Wind rose

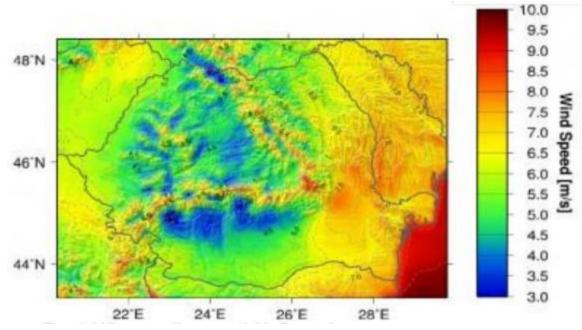


Figure No. 123- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

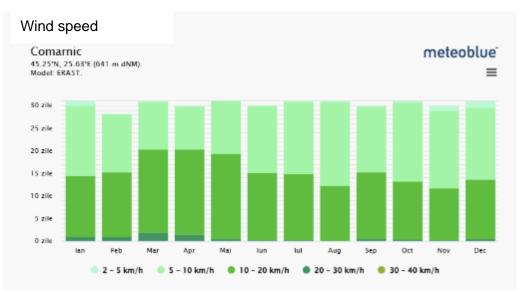


Figure No. 124- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-





In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.5										
1	Show 5	i rows	-	Сору	CSV	Excel				
									Search: 2071	
	date ≬	med		min (	$max \downarrow$	an $\phi$	change_med	change_max	change_min ()	med 1971 2000
	2071- 02-28	3	2	3	4.3	2071	-0.3	0.8	-0.5	3.5
5	Showing	1 to 1 (	of 1	entries ()	filtered fr	am 130	total entries)			ious 1 Next

Average wind speed in February - RCP45 Scenario (Colibași - County of Giurgiu) - reference period 1971-2000



In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

## 5.4 Goștinari

#### 5.4.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

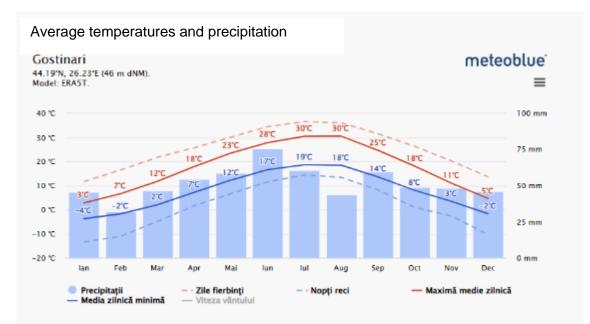


Figure No. 125 - Average value of extreme temperatures over the last 30 years at the weather station<sup>24</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.2 °C:

Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000

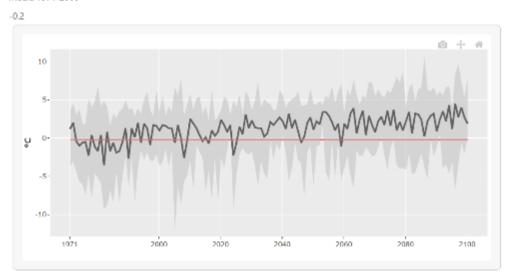


Figure No. 126 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>24</sup> Source: www.meteoblue.com

# Average temperature in February - RCP45 Scenario (Gostinari - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Gostinari - County of Giurgiu) -

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

	rows <del>*</del>						Search: 2071	
date ≬	med ()	min (	max ()	an ()	change_med ()	change_max ≬	change_min	med_1971_2000
2071- 02-28	2.2	-1.2	6.4	2071	2.4	6.6	-1	-0

Average temperature in February - RCP45 Scenario (Gostinari - County of Giurgiu) - reference period 1971-2000

Show 5	rows *	Copy	CSV	Excel				
							Search: 2100	
date ≬	med 🌗	min (	max ()	an ≬	change_med 🌢	change_max 🌗	change_min (	med_1971_200
2100- 02-28	1.9	0.2	7.8	2100	2.1	8	0.4	l · · · ·

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 5.4.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.7 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Gostinari - County of Giurgiu) reference period 1971-2000

	i rows *						Search:	2071	
date ≬	med ≬	min (	max (	an (	change_med	change_max 🌢	change_r	min 🔶 m	red_1971_2000
2071- 02-15	91	66.8	130.7	2071	-12.7	27		-36.9	103

# Global solar radiation in February - RCP45 Scenario (Gostinari - County of Giurgiu) - reference period 1971-2000

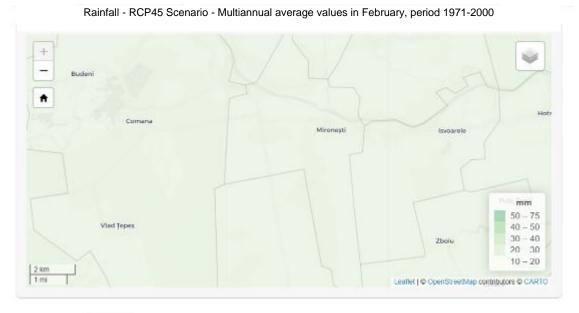
							Search: 2100	
date ≬	med $\phi$	$\min \phi$	max ()	an $\phi$	change_med ()	change_max (	change_min (	med_1971_2000
2100- 02-15	109.1	58.5	136.4	2100	5.4	32.7	-45.2	103

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 91 W/mp, and at the level of year 2100 it is estimated at 109.1 W/mp, which is higher than the multiannual average value of 103.7 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 5.4.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 38.6 mm, and by 2100 it will reach 12.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



# Rainfall in February - RCP45 Scenario (Gostinari - County of Giurgiu) - reference period 1971-2000

Show		Сору						
							Search: 2071	
date	med ()	min (	max (	an (	change_med	change_max (	change_min	med_1971_20
2071- 02-28	38.6	7.4	70.8	2071	60.4	194.2	-69.3	

Rainfall in February - RCP45 Scenario (Gostinari - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

							Search: 2100	
ate 🌖 n	ned ≬	min 🕴	max (	an (	change_med (	change_max ≬	change_min 🌖	med_1971_2000 (
100- 2-28	12.1	3.6	58.3	2100	-49.7	142.2	-85	24.1

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

## 5.4.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

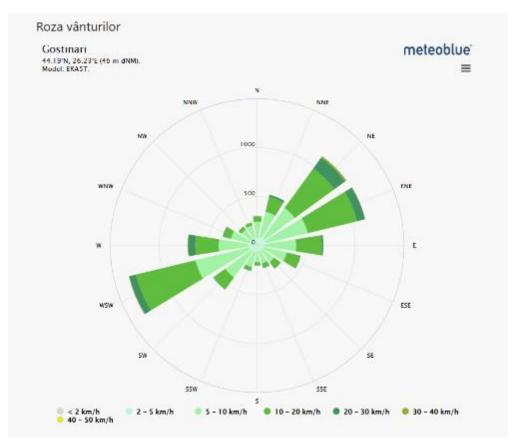


Figure No. 127- Wind rose

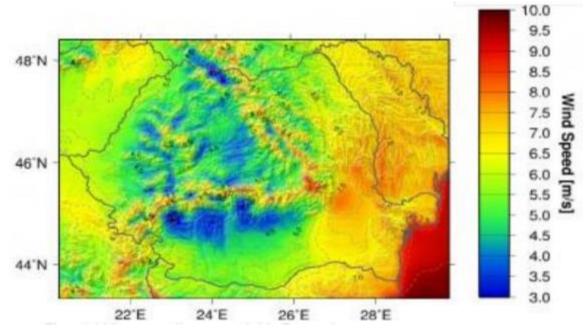


Figure No. 128- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

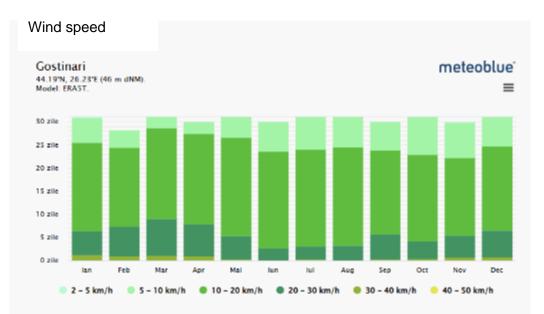
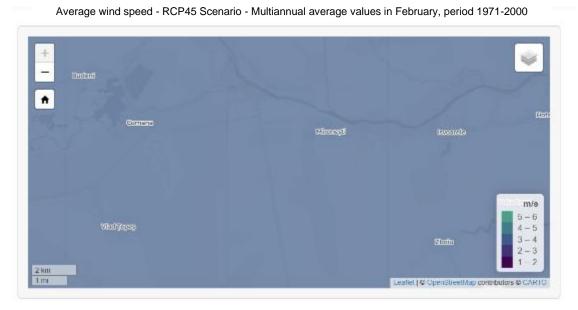


Figure No. 129- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Gostinari - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hantă (regiunea de intensi) pentru actualizare grafic și valori 3.5 Search: 20/1 an 🕕 change\_med | change\_max | change\_min med\_1971\_2000 date 🗄 med max 🔶 min 2071-3.2 3 43 2071 -0.3 0.8 -0.5 3.5 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Average wind speed in February - RCP45 Scenario (Gostinari - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hertă (regiunes de interes) pentru actualizare grafic și valori

3.5											
	Show	5 rows <del>*</del>	Сору	CSV	Excel			Search:	2100		
	date (	med 0	min (	max ()	an ()	change_med	change_max (	change_m	in 🕴 me	ed_1971_200	0
	2100- 02-28	3.3	2.4	4.9	2100	-0.2	1.4		-1.1		3.5
	Showing	1 to 1 of 1	entries (	filtered fr	om 130	total entries)				1 Next	

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 5.5 Isvoarele

#### 5.5.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.



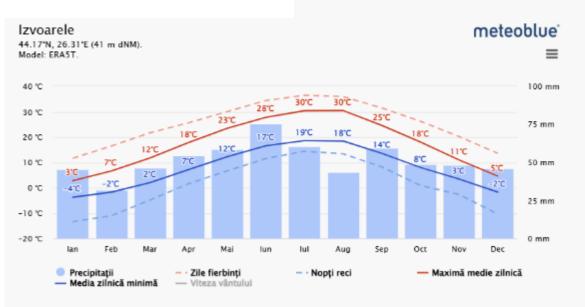


Figure No. 130 - Average value of extreme temperatures over the last 30 years at the weather station<sup>25</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:

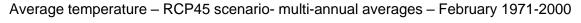
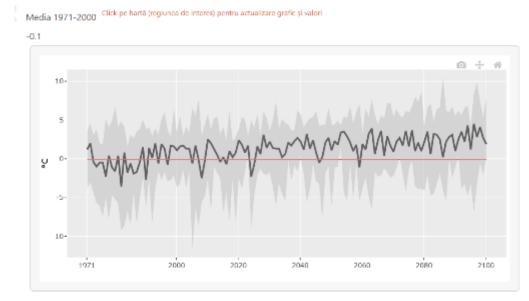




Figure No. 131 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>25</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Isvoarele - County of Giurgiu) - reference period 1971-2000

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Isvoarele - County of Giurgiu) - reference period 1971-2000

511044	5 rows •	сору	0.5 V	Excel			Search: 2071	
date ≬	med ≬	min (	max ≬	an 🕴	change med	change max 🕴	change min (	med 1971 2000
2071- 02-28	2.2	-1.2	6.4	2071	2.3	6.5	-1.1	-(

Average temperature in February - RCP45 Scenario (Isvoarele - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

-0.1 Search: 2100 med 1971 2000 date 🕚 med 🔶 min 🕚 max 🔶 an 🔶 change med 🕴 change max 🧄 change\_min 🌗 2100 1.9 0.2 7.9 2100 2 8 0.3 0.1 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

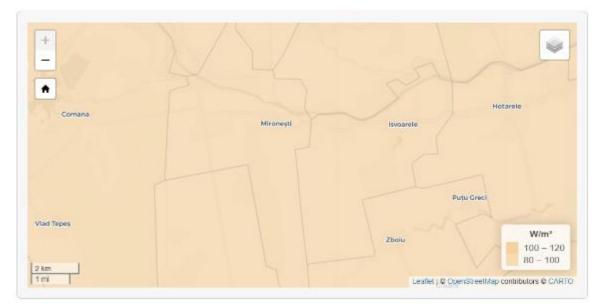
Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 5.5.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.6 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Isvoarele - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 103.6 Show 5 rows - Copy CSV Excel

Show 5	rows +	Сору	CSV	Excel				
							Search: 2071	
date 💧	med ≬	min 🕴	max 🔶	an 🔶	change_med 🌢	change_max 🌢	change_min ≬	med_1971_2000 ≬
2071- 02-15	91.5	66.8	131.4	2071	-12.1	27.8	-36.8	103.6
Showing 1	to 1 of 1	entries (f	iltered fro	om 130 t	total entries)			
								ous 1 Next

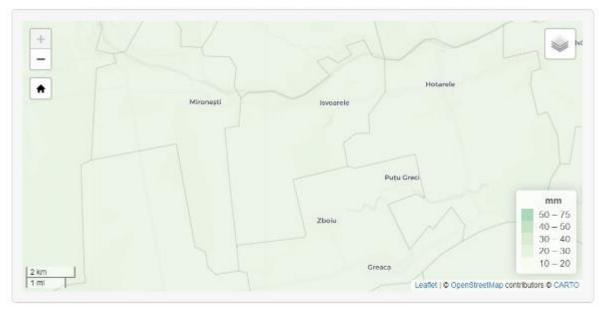
Show	5 rows <del>-</del>	Сору	CSV Exc	el			
					2	earch: 2100	
date ≬	med ()	min (	max 🌾 an	change_med	change_max 🌢 ch	ange_min 🌖 med_	1971_200
2100- 02-15	109	58.5	136.3 21	00 5/	4 32.7	-45.1	10

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 91.5 W/mp, and at the level of year 2100 it is estimated at 109.0 W/mp, which is higher than the multiannual average value of 103.6 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

# 5.5.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.6 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.0 m, and by 2100 it will reach 10.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

date () med () min () max () an () change	Search: 2071
date () med () min () max () an () change	
	o_med ≬ change_max 🌵 change_min 🌵 med_1971_20
2071- 36.8 7.5 69.7 2071 02-28	55.9 195.3 -68.2
Showing 1 to 1 of 1 entries (filtered from 130 total entr	rries)

Rainfall in February - RCP45 Scenario (Isvoarele - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

							Search:	2100	
date 🕴	med $\phi$	min (	max (	an (	change_med	change_max ()	change_m	nin († 1	ned_1971_2000 (
2100- 02-28	11.8	3.5	56.1	2100	-50	137.7		-85.2	23.6

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

### 5.5.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

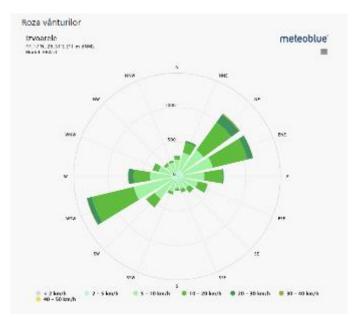


Figure No. 132- Wind rose

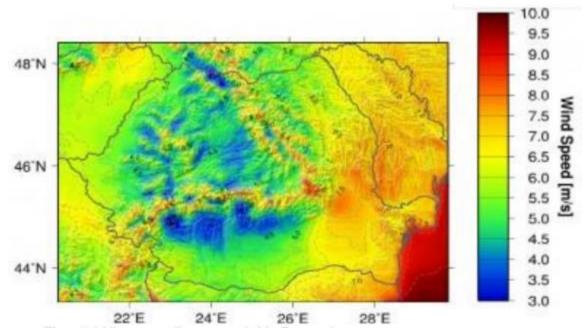


Figure No. 133- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.



Figure No. 134- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.4 m/s in 2100, respectively.

Show 5	rows *	Сору	CSV	Excel			Search: 2071	
date ≬	med ≬	min (	max (	an ≬	change_med ()	change_max 🌒	change_min	med_1971_2000
2071- 02-28	3.2	3	4.4	2071	-0.3	0.9	-0.5	3

Average wind speed in February - RCP45 Scenario (Isvoarele - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Average wind speed in February - RCP45 Scenario (Isvoarele - County of Giurgiu) - reference period 1971-2000

							Search:	2100	
date ≬	med ≬	min (	max ()	an ()	change_med	change_max ()	change_m	in 🕕 med_19	71_2000 ()
2100-	3.4	2.4	4.9	2100	-0.1	1.4		-1.1	3.5

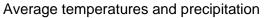
In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

### 5.6 Herăști

#### 5.6.1 Temperature variability

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori



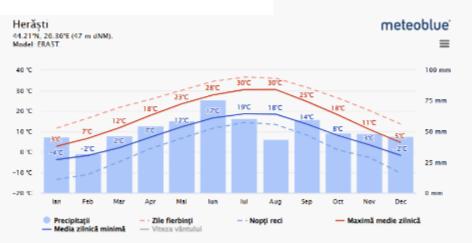


Figure No. 135 - Average value of extreme temperatures over the last 30 years at the weather station<sup>26</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0°C:

Average temperature – RCP45 scenario- multi-annual averages – February 1971-2000

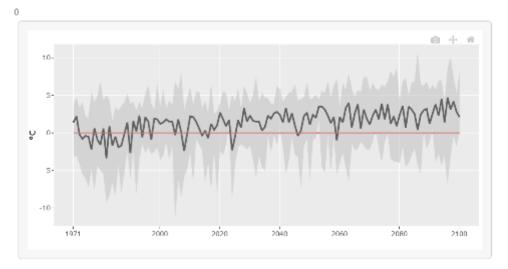


Figure No. 136 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>26</sup> Source: *www.meteoblue.com* 

Average temperature in February - RCP45 Scenario (Herăști - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

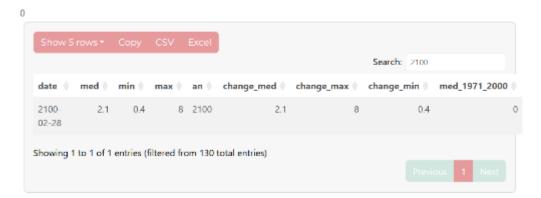


In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Herăști - County of Giurgiu) - reference period 1971-2000

Show 5	rows *	Сору	CSV	Excel			c . 1	
							Search: 2071	
date ≬	med ≬	min 🕴	max ≬	an ≬	change_med (	change max (	change_min (	med 1971 20
2071- 02-28	2.3	-1.1	6.6	2071	2.3	6.6	-1.1	

Average temperature in February - RCP45 Scenario (Herăști - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click pe bartă (regiunea de interes) pentru actualizare grafic și valori



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

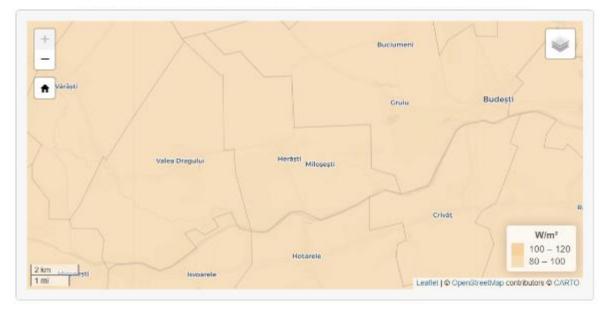
## 5.6.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.6 W/m<sup>2</sup>.

Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000



#### Global solar radiation in February - RCP45 Scenario (Herăști - County of Giurgiu) - reference period 1971-2000

		000	C3V	Excel			Search: 207	71
date 🔶	med ≬	min (	max (	an 🕴	change_med (	change_max ≬	change min	med 1971 2000
2071- 02-15	92.4	67.5	129.7	2071	-11.2	26.1	-36	5.1 103.6

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.6

Global solar radiation in February - RCP45 Scenario (Herăști - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

	rows *						Search: 2100	J
date ≬	med (	min (	max (	an (	change_med	change_max	change_min	med_1971_2000
2100- 02-15	108.4	59.2	136.1	2100	4.8	32.5	-44.	4 10

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.4 W/mp, and at the level of year 2100 it is estimated at 108.4 W/mp, which is higher than the multiannual average value of 103.6 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 5.6.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 22.7 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 32.2 mm, and by 2100 it will reach 9.6 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Rainfall in February - RCP45 Scenario (Herăști - County of Giurgiu) - reference period 1971-2000

					5 (Heräști - jude) entru actualizare grafi		rioada de referir	nță 1971 - 2000
22.7								
Show	5 rows +	Сору	CSV	Excel				
							Search: 2071	
date (	med (	min (	max ()	an (	change_med ()	change_max (	change min (	med 1971 2000
2071- 02-28	32.2	5.8	72.5	2071	42.1	219.9	-74.4	22.7
Showing	1 to 1 of 1	l entries (	filtered fr	rom 130	total entries)		Previ	ious 1 Next

Rainfall in February - RCP45 Scenario (Herăști - County of Giurgiu) - reference period 1971-2000

					-		Search: 2100	
date 🔶	med ()	min ()	max ()	an ()	change_med	change_max 🌢	change_min	med_1971_2000 (
2-28	9.6	3.5	54.9	2100	-57.6	142.3	-B4.6	22.3

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

## 5.6.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

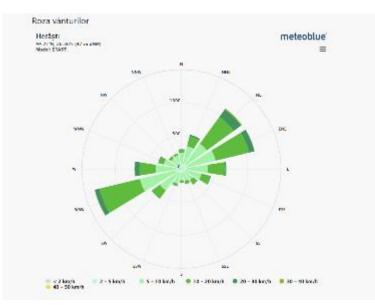


Figure No. 137- Wind rose

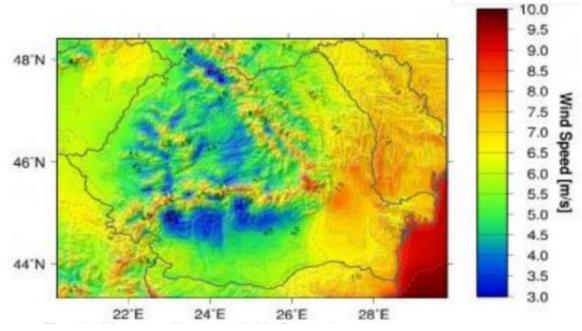


Figure No. 138- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

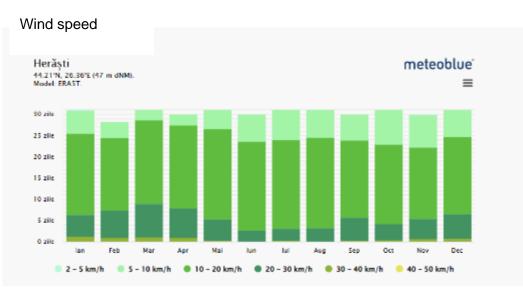


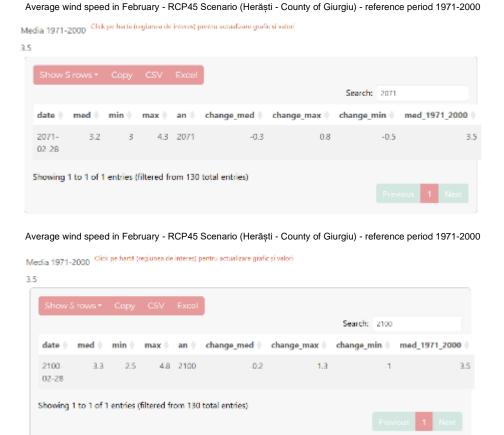
Figure No. 139- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

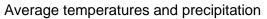


In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

## 5.7 Hotarele

### 5.7.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.



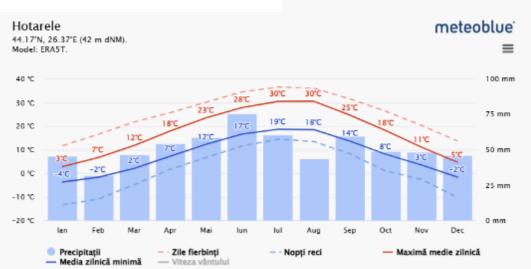


Figure No. 140 - Average value of extreme temperatures over the last 30 years at the weather station<sup>27</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is 0°C:

## Average temperature – RCP45 scenario- multi-annual averages – February 1971-2000

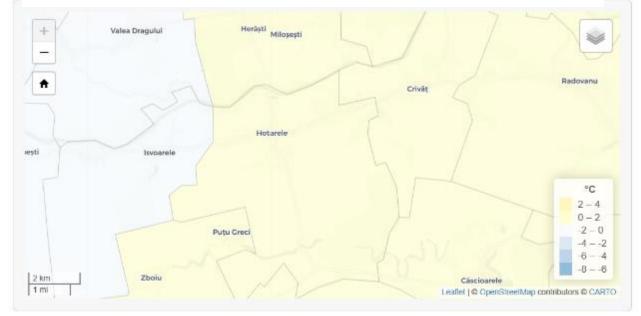
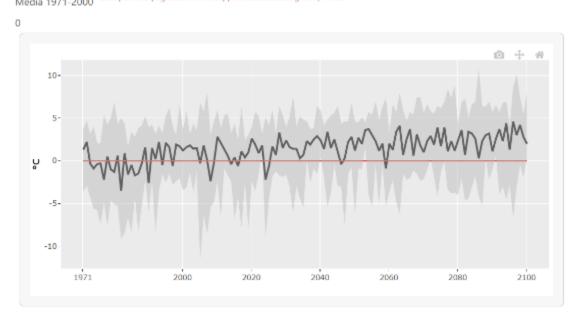


Figure No. 141 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>27</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Hotarele - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Hotarele - County of Giurgiu) - reference period 1971-2000

							Search: 2071	
ate	med ()	$\min  \phi$	max ()	an ()	change_med ()	change_max	change_min (	med_1971_2000
071- 2-28	2.3	-1	6.6	2071	2.3	6.6	-1	C

Average temperature in February - RCP45 Scenario (Hotarele - County of Giurgiu) - reference period 1971-2000



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

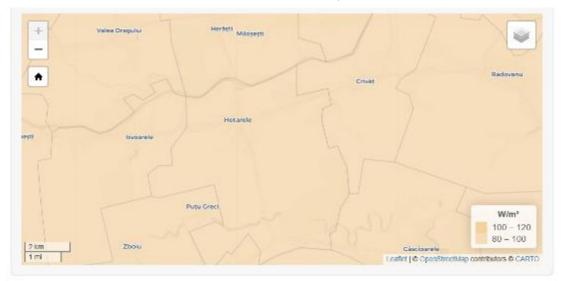
Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

## 5.7.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 103.5 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Hotarele - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

103.5

							Search: 2071	
date 🔶	$\mathbf{med} \ \phi$	$\min \phi$	max ()	an $\phi$	change_med	change_max	change_min (	med_1971_2000
2071- 02-15	92.1	67.2	131.5	2071	-11.4	28	-36.3	103.5

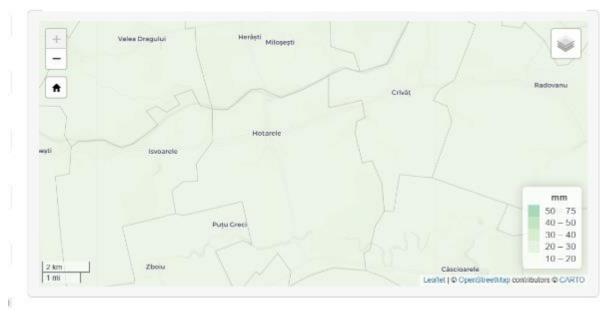
Show 5	rows *	Сору	CSV	Excel				
					,		Search: 2100	
date ≬	med ()	$\min  \phi$	max $\phi$	an $\phi$	change_med	change_max (	change_min (	med_1971_2000
2100- 02-15	108.7	58.1	136.2	2100	5.2	32.7	-45.4	103.5

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 92.1 W/mp, and at the level of year 2100 it is estimated at 108.7 W/mp, which is higher than the multiannual average value of 103.5 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 5.7.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.0 mm, and by 2100 it will reach 10.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.





Rainfall in February - RCP45 Scenario (Hotarele - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartà (regiunea de interes) pentru actualizare grafic și valori

							Search: 2071	
date ≬	med ()	$\min \phi$	max ()	$\mathbf{an} \ \phi$	change_med	change_max (	change_min (	med_1971_2000
2071- 02-28	33.3	8	69.5	2071	44	200.6	-65.4	2

Rainfall in February - RCP45 Scenario (Hotarele - County of Giurgiu) - reference period 1971-2000

```
Media 1971-2000 Click pe hartà (regiunea de interes) pentru actualizare grafic și valori
23.1
                                                                                      Search: 2100
                                                                                                     med_1971_2000
    date 🕚
             med ≬
                       min 🕴
                                                change_med 🕴 change_max 🌗
                                                                                    change_min ≬
                                max
                                         an 🕚
    2100-
                                        2100
                                                            49.8
                                                                             133.6
                                                                                              -84.9
                                                                                                                    23.1
                 11.6
                          3.5
                                    54
    02-28
   Showing 1 to 1 of 1 entries (filtered from 130 total entries)
```

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 5.7.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

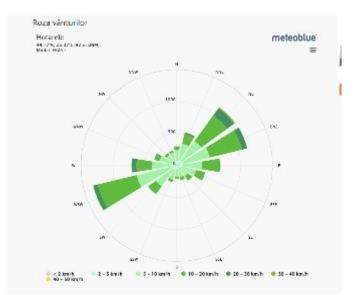


Figure No. 142- Wind rose

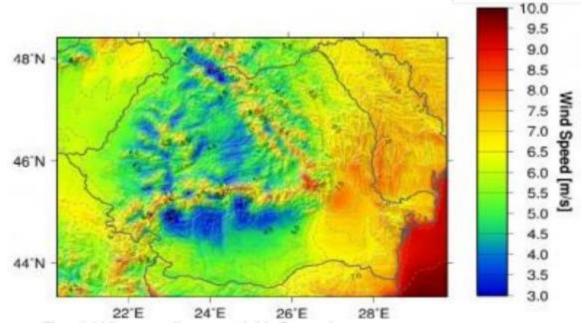


Figure No. 143- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

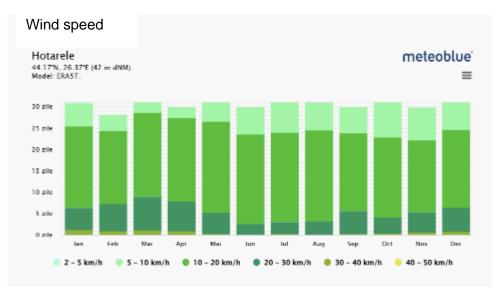


Figure No. 144- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.6 m/s - in February (as shown in the graph below).

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000



In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February	DCD45 Cooperia (Hotorola	County of Ciuraiu) referen	an nariad 1071 2000
Average wind speed in February	- RUP45 Scenario (notarele	- County of Gluralu) - referen	

Madia 1071 2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

Show 5	i rows *	Сору	CSV	Excel			Search: 2071	
date ≬	med 🌗	min 🕴	max (	an ≬	change_med (	change_max	change_min (	med_1971_2000
2071- 02-28	3.3	3.1	4.4	2071	-0.3	0.8	-0.5	3.6

Average wind speed in February - RCP45 Scenario (Hotarele - County of Giurgiu) - reference period 1971-2000

Media 1971-2000	Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

3.6											
	Show 5	rows +	Сору	CSV	Excel						
								Search:	2100		
	date ≬	med ()	$\min \phi$	$\max \phi$	an $\phi$	change_med ()	change_max	change_n	nin 🔶 r	med 1971	2000 (
	210D- 02-28	3.5	2.4	5	2100	-0.1	1.4		-1.2		3.6
;	Showing 1	to 1 of 1	entries (	filtered fr	om 130	total entries)					
										us 1 N	

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

### 5.8 Mihăileşti

#### 5.8.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.

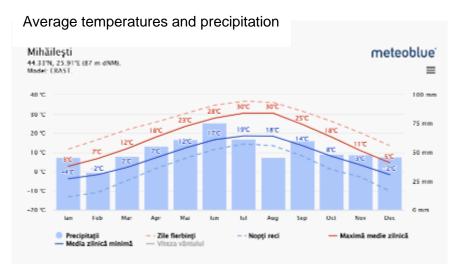


Figure No. 145 - Average value of extreme temperatures over the last 30 years at the weather station<sup>28</sup>

Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.2 °C:

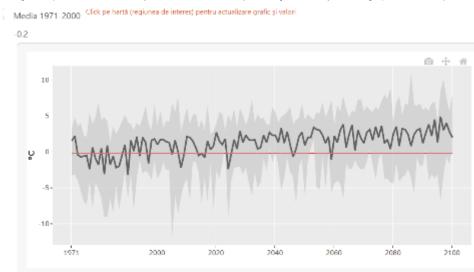
Average temperature - RCP45 scenario- multi-annual averages - February 1971-2000



Figure No. 146 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>28</sup> Source: www.meteoblue.com

Average temperature in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000



In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000

Show 5	rows *	Сору	CSV	Excel				
							Search: 2071	
late ≬	$med \ \phi$	min ()	max $\phi$	an ()	change_med $\phi$	change_max 🌢	change_min 🕴	med_1971_2000
2071- 02-28	2.7	-1.3	6.3	2071	2.9	6.5	-1.1	-(

Average temperature in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000

dia 1971-20	000 <sup>Click</sup>	pe hartă (re	giunea de	interes) pe	entru actualizare grafic	și valori		
Show 5 r	ows -	Сору	CSV	Excel				
							Search: 2100	
date ≬	med 🌗	$\min \phi$	max 🕴	an $\phi$	$change\_med ~ \emptyset$	change_max $\phi$	change_min 🕴	med_1971_2000
2100- 02-28	2	0.3	8	2100	2.2	8.2	0.5	-0.2
Showing 1	to 1 of 1	entries (f	iltered fr	om 130 1	total entries)			ous <mark>1</mark> Next

According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

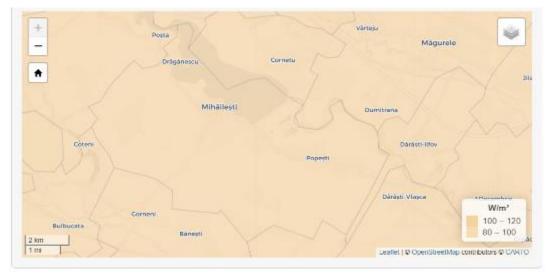
Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

#### 5.8.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is 104.2 W/m<sup>2</sup>.



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hattă (regiunea de interes) pentru actualizare godic și valori 104.2 Search: 2071 med\_1971\_2000 change max 4 date med min max an change med change min 2071 94.4 68.2 126.7 2071 9.8 22.5 36 104.2 02-15 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Global solar radiation in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

ledia 1971-2000

	~		-	
Т	U	4.	2	
	~		_	

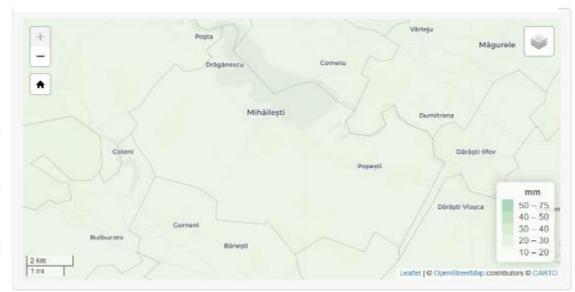
date 🔶	med (	min (	max (	an 🔶	change_med	change_max 🌢	change_min 🌢	med_1971_2000
2100- 02-15	107.8	59.6	135.8	2100	3.6	31.6	-44.6	104.2

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 94.4 W/mp, and at the level of year 2100 it is estimated at 107.8 W/mp, which is higher than the multiannual average value of 104.2 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 5.8.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 23.6 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 40.1 mm, and by 2100 it will reach 11.7 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Rainfall in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click probartă (regiunea de interes) pentru actualizare grafic și valuri

23.6

							Search: 2071	
date ≬	med	min (	max ()	an $\phi$	change_med	change_max	change_min (	med_1971_2000
2071- 02-28	40.1	4.2	81.1	2071	69.6	243	-82.2	23.0

Rainfall in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori

8.6		i rows •	Сору	CSV	Excel					
ľ								Search:	2100	
	date ≬	$med \ \emptyset$	$\min \phi$	$max \downarrow$	an $\phi$	change med ()	change max (	change n	nin 🌾 med	1971 2000
	210D- 02-28	11.7	3.6	63.3	2100	-50.5	167.7		-84.8	23.0
5	ihowing '	1 to 1 of 1	entries (	filtered fr	om 130	total entries)			Previous	1 Next

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 5.8.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

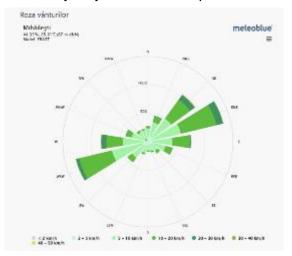


Figure No. 147- Wind rose

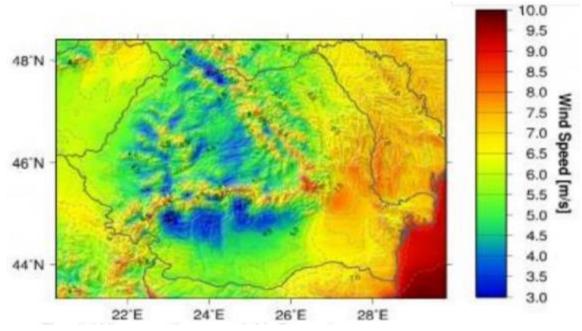


Figure No. 148- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

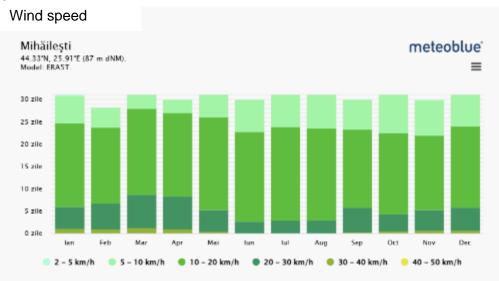
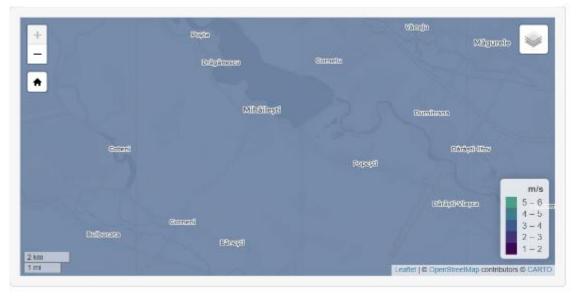


Figure No. 149 The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.5 m/s - in February (as shown in the graph below).



Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000

							Search: 2071	
date 🗄	med ()	min 🕴	$max \downarrow$	an ()	change_med	change_max (	change_min	med_1971_2000
2071- )2-28	3.2	2.9	4.2	2071	-0.3	0.7	-0.6	3

Average wind speed in February - RCP45 Scenario (Mihăilești - County of Giurgiu) - reference period 1971-2000

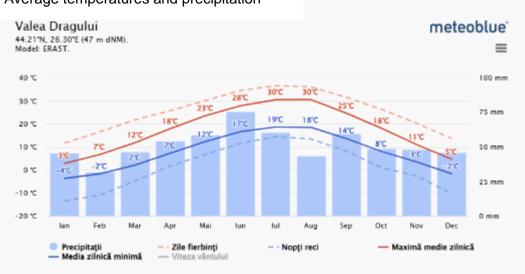
Me 3.5	dia 1971	-2000 <sup>Ciki</sup> 5 rows *		-		ientru actualizare grafi	c și valori		
	Show	STOWS*	Сору	ωv	Excer			Search: 2100	
	date ≬	med 🌖	min 🕴	max ≬	an 🌗	change med 🌢	change max 🌗	change min 🌗	med 1971 2000 🕴
	2100- 02-28	3.2	2.7	4.7	2100	-0.3	1.2	-0.8	3.5
	Showing	1 to 1 of 1	1 entries (	filtered fr	om 130	total entries)			ious 1 Next

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

#### 5.9 Valea Dragului

#### 5.9.1 <u>Temperature variability</u>

As for the temperature evolution at the weather station (according to data from the meteoblue.ro website), the average of the monthly minimum and maximum temperatures recorded in the last 30 years is shown in the graph below.



Average temperatures and precipitation

Figure No. 150 - Average value of extreme temperatures over the last 30 years at the weather station<sup>29</sup>

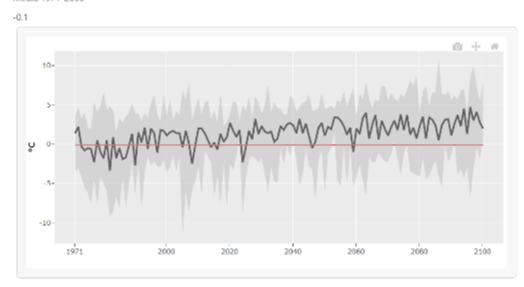
Also, according to the data found on the RO-ADAPT platform, during the period 1971-2000, the average temperature in February is -0.1°C:



Average temperature – RCP45 scenario- multi-annual averages – February 1971-2000

Figure No. 151 - Average temperature at TAU level (period 1971 -2000)

<sup>&</sup>lt;sup>29</sup> Source: www.meteoblue.com



Average temperature in February - RCP45 Scenario (Valea Dragului - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Lack penarta (repurse de interes) period actualizate grain, și valori

# In 2071 and 2100 respectively, February is expected to have the following average temperature values:

Average temperature in February - RCP45 Scenario (Valea Dragului - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

0.1										
1	Show 5	rows -	Сору	CSV	Excel					
								Search: 20	71	
	date ≬	med ()	$\min \phi$	max (	an $\phi$	$change\_med ~ \emptyset$	change_max	change_min	med_1971	1_2000 (
	2071- 02-28	2.2	-1.2	6.5	2071	2.3	6.6	-1	.1	-0.1
3	Showing 1	l to 1 of 1	entries (	filtered fr	om 130	total entries)			revious 1	

Average temperature in February - RCP45 Scenario (Valea Dragului - County of Giurgiu) - reference period 1971-2000



According to the above, an increasing trend of the average temperature can be observed in the next period, compared to the multiannual average over the period 1971-2000.

Taking into account the above mentioned temperature variation and its increasing trend in the next period, it can be concluded that the <u>risk</u> of the project being affected by the positive temperature variation in the next period <u>is medium</u>.

#### 5.9.2 Heat stress

Heat stress is one of the factors experienced by people working inside buildings/enclosed spaces or that may be affected by changes due to the impact of heat stress on buildings/facilities, etc.

Along with the impact that climate change may have on infrastructure in particular, this factor may have negative effects on the population. In this respect it is recommended to use materials that help minimising this stress for road/maritime infrastructure projects.

At locality level, based on the data provided by the RO-ADAPT Platform related to the global solar radiation, for the period 2071-2100 (compared to the reference period 1971-2000), it is  $103.6 \text{ W/m}^2$ .



Global solar radiation - RCP45 Scenario - Multi-annual average values in February, period 1971-2000

Global solar radiation in February - RCP45 Scenario (Valea Dragului - County of Giurgiu) - reference period 1971-2000

Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori

103.6

nin 🔶 ma	ix 🕴 an 🕴	change_med	change_max (	change_min (	med_1971_2000
66.8 1	30.5 2071	-11.7	26.9	-36.8	103.6
	66.8 1	66.8 130.5 2071	66.8 130.5 2071 -11.7	66.8 130.5 2071 -11.7 26.9	

Show 5	rows *	Contra	<u></u>	Event				
SHOW 3	rows •	Copy	ωv	Excer			Search: 2100	
date ≬	med ()	min (	max (	an (	change_med (	change_max (	change_min (	med_1971_200
2100- 02-15	108.7	59.1	136.3	2100	5.1	32.7	-44.5	10

According to the above (data from the RO-ADAPT Platform), the average value of the index at the level of year 2071 is 91.9 W/mp, and at the level of year 2100 it is estimated at 108.7 W/mp, which is higher than the multiannual average value of 103.6 W/mp. We can observe a decreasing trend of solar radiation at ATU level in the next period, so that the risk of exposure of this project to this factor is <u>medium</u>.

## 5.9.3 Heavy rainfall

Based on the information provided by the RO-ADAPT Platform, for the period 1971-2000, the average multiannual precipitation value is 24.1 mm, as shown in the figure below.

According to the same RO-ADAPT data platform, for the next period 2071 - 2100, the amount of precipitation in February 2071 is estimated to be 41.0 m, and by 2100 it will reach 10.1 mm. A decreasing trend in precipitation can be observed for the period 2000 -2071 but also for the period 2071 -2100.



Rainfall - RCP45 Scenario - Multiannual average values in February, period 1971-2000

Media 1971-2000 Click pe hartă (reglunea de interes) pentru actualizare grafic și valori 233 Search: 2071 change\_med | change\_max | change\_min | med\_1971\_2000 date 🕚 med 🗄 min 🕚 an 🔶 max 2071-36.3 5.1 73.9 2071 55.6 216.8 78.1 23.3 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries) Rainfall in February - RCP45 Scenario (Valea Dragului - County of Giurgiu) - reference period 1971-2000 Media 1971-2000 Click pe hartă (regiunea de interes) pentru actualizare grafic și valori 23.3 Search: 2100 an 🗄 change med 
change max med 1971 2000 date ( change min ( min max 🗄 med 2100 10 3.5 57.6 2100 -57.1 146.9 -85 23.3 02-28 Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Rainfall in February - RCP45 Scenario (Valea Dragului - County of Giurgiu) - reference period 1971-2000

From the above figures it can be seen that the exposure of the project under review to this variable is an average exposure.

#### 5.9.4 Wind speed

Wind is the climate element that best reflects the influence of the general atmospheric circulation. The site area is predominantly influenced by north-easterly and south-westerly winds. On average, there are 3 days a year with wind speeds above 38 km/h.

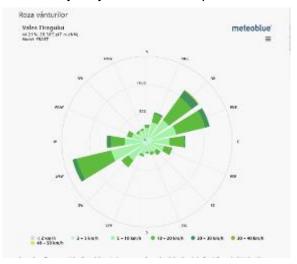


Figure No. 152- Wind rose

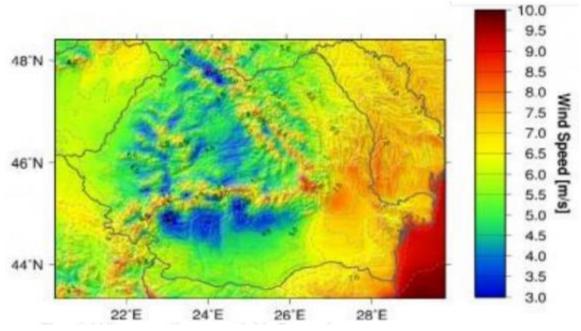


Figure No. 153- Average wind speed in Romania

According to the Report of the National Meteorological Administration (2015): "Climate Change - From the Physical Basis to Risks and Adaptation", wind speed shows major changes in terms of its long-term evolution.

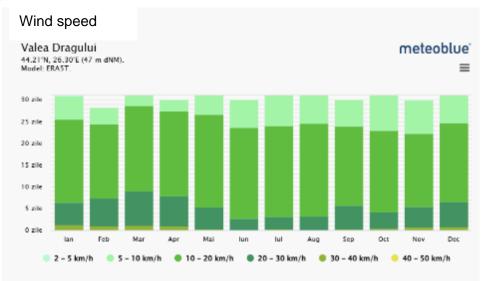


Figure No. 154- The chart shows the variation in a month when the wind reaches a certain speed

According to the data found on the RO-ADAPT Platform, in the period 1971-2000, the multiannual average in the area of the locality is 3.6 m/s - in February (as shown in the graph below).

Average wind speed - RCP45 Scenario - Multiannual average values in February, period 1971-2000

+ Edge	ជ		X	Deducad	-
	anaga			Statis	Et
esterat		Qetimes (Geograficat)	Notine Clispen)		
1					m/s 5-0 4-5
7 ini	Wheenpil	Georgeothe	(tanvele Leader   C	a Open Stract Map <b>com</b> t	2 3 1-2 DIMIS © CATTO

In the following period, 2000 - 2071, 2071 - 2100, the estimated wind intensity in the locality area is 3.2 m/s, and 3.3 m/s in 2100, respectively.

Average wind speed in February - RCP45 Scenario (Valea Dragului - County of Giurgiu) - reference period 1971-2000

6								
Show 5 r	ows *	Сору	CSV	Excel				
							Search: 207	71
date 👘 r	med	min	max	an 🕴	change_med	change_max	change_min	med_1971_2000
2071- 02-28	3.2	3	4.3	2071	-0.4	0.7	-0.	δ
howing 11	o 1 of 1	entries (i	filtered fr	om 130	total entries)			
								evious 1 Next
								evicus 1 Next
Average	wind spe	eed in F	ebruary	- RCP4	15 Scenario (Vale			- reference period
Average v						00		1
0					1071 200	00		1
ledia 1971-:	2000 Cik	k pe hartä	(regiunea de	e interes) (	1071 200 pentru actualizare grafic	00		1
ledia 1971-:	2000 Cik	k pe hartä		e interes) (	1071 200 pentru actualizare grafic	00	unty of Giurgiu)	1
ledia 1971-:	2000 Cik	k pe hartä	(regiunea de	e interes) (	1071 200 pentru actualizare grafic	00		1
ledia 1971-:	2000 <sup>Clic</sup> i rows *	k pe hartä	(regiunea de CSV	e interes) ; Excel	1071 200 pentro actualizare grafic	nn t și valori	unty of Giurgiu) Search: 2100	1

In conclusion, in the project area there is <u>a low risk of exposure</u> of the project to this climatic factor.

Showing 1 to 1 of 1 entries (filtered from 130 total entries)

Subsemnata VERDES ALINA traducator autorizat de Ministerul Justitiei cu nr. 24515/19.12.2008, certific exactitatea traducerii cu textul inscrisului original din limba romana in limba engleza.

I, the undersigned VERDES ALINA, authorized translator of the Romanian Ministry of Justice accreditation no.24515/19.12.2008 do hereby certify that this is a true and accurate translation of the original document, from Romanian into English language.

/

1