

Technical report for the objective estimate of SO₂ for vegetation protection in the zone IT0445 - year 2022

INTRODUCTION

The objective estimate is applied for the assessment of the critical level of SO₂ in the presence of an winter average under the lower assessment threshold (LAT) of 8 µg/m³ in a rural background area, a requirement that is already reached in the urban background station BZ6 (IT2096A).

PROCEDURE

This evaluation was carried out by applying a corrective factor K to the annual and winter averages of the urban background station BZ6. The correction factor was calculated from the ratio of the annual averages of SO₂ in the area of the BZ6 station and in the area of the background near-city rural station RE1 (IT0505A). These annual averages have been determined with a model based on the emissions inventory and on the meteorological data of 2013 of the Province of Bolzano. The model underlying the 2013 estimate is still relevant in 2022, because the annual and winter averages of the reference station BZ6 since 2013 have remained stable at very low values between 1-2 µg/m³ and below the 2013 values (see table in the appendix). Furthermore, there is no indication of any increase in SO₂ emissions. The scenario that is confirmed is well below the critical level. The area of the background near-city rural station RE1 is representative of the IT0445 area.

CALCULATION OF THE FACTOR K

Ratio between the 2013 annual averages for SO₂ of the BZ6 and RE1 areas

The corrective factor K is given by the ratio between the average annual values of SO₂ in the BZ6 area and in the RE1 area obtained from the aforementioned 2013 model:

$$C_{\text{areaBZ6}} = 2,1 \mu\text{g}/\text{m}^3 \text{ (annual average)}$$

$$C_{\text{areaRE1}} = 0,5 \mu\text{g}/\text{m}^3 \text{ (annual average)}$$

$$K = C_{\text{areaBZ6}} / C_{\text{areaRE1}} = 2,1 \mu\text{g}/\text{m}^3 / 0,5 \mu\text{g}/\text{m}^3 = 4,2$$

CALCULATION OF THE ANNUAL AND WINTER AVERAGE OF SO₂

The annual average and the winter average of SO₂ for the IT0445 zone are determined by dividing each year the corresponding aggregate value of the BZ6 station by the K factor calculated above:

$$C_{\text{a.avg IT0445}} = C_{\text{a.avg BZ6}} / K = C_{\text{a.avg BZ6}} / 4,2$$

$$C_{\text{w.avg IT0445}} = C_{\text{w.avg BZ6}} / K = C_{\text{w.avg BZ6}} / 4,2$$

$C_{\text{a.avg IT0445}}$ = average annual concentration in the IT0445 area

$C_{\text{w.avg IT0445}}$ = average winter concentration in the IT0445 area

ESTIMATE of the annual average of SO₂ in 2022

The estimate of the annual average SO₂ for the AQR 2022 results by dividing the annual average SO₂ of the BZ6 by the corrective factor K:

$$C_{a.avg} BZ6 = 0,92 \mu\text{g}/\text{m}^3$$

$$C_{a.avg} IT0445 = C_{a.avg} BZ6 / K = 0,92 \mu\text{g}/\text{m}^3 / 4,2 = \underline{\underline{0,22 \mu\text{g}/\text{m}^3}}$$

ESTIMATE of the winter average of SO2 in 2022

The estimate of the winter average SO2 for the AQR 2022 results by dividing the winter average SO2 of the BZ6 by the corrective factor K:

$$C_{w.avg} BZ6 = 1,15 \mu\text{g}/\text{m}^3$$

$$C_{w.avg} IT0445 = C_{w.avg} BZ6 / K = 1,15 \mu\text{g}/\text{m}^3 / 4,2 = \underline{\underline{0,27 \mu\text{g}/\text{m}^3}}$$

CONCLUSION

Both the winter average measured at the background urban station BZ6 (IT2096A) in Bolzano and the one estimated for the area IT0445 (SOUTH TYROL) corresponding to the area of the near-city rural station of background RE1 (IT0505A) in Renon are lower than the evaluation threshold of 8 $\mu\text{g}/\text{m}^3$.

Bolzano, 10.02.2023

APPENDIX I

	Annual mean (20XX)	Winter mean (01.10.20XX-1 - 31.03.20XX)
	SO2	SO2
	Station BZ6	Station BZ6
Year	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
2013	1,43	2,31
2014	1,1	1,72
2015	1,18	1,58
2016	0,77	1,38
2017	0,91	1,06
2018	1,1	1,5
2019	1	1,3
2020	0,8	1,19
2021	0,96	1,21
2022	0,92	1,15